THE INEDIBLE TALLOW AND GREASE INDUSTRY

Changes in Markets, Practices, and Costs

MARKETING RESEARCH REPORT NO. 342

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PREFACE

This report on the growth, marketing practices, and costs of renderers of inedible animal fats is one of a group of reports dealing with the marketing of agricultural products issued by the Marketing Research Division of the Agricultural Marketing Service, U. S. Department of Agriculture. It is a part of a broad program of research designed to reduce the cost and improve the efficiency of marketing farm products.

The analysis is largely concerned with firms that are engaged primarily in the production of inedible tallow and grease and feed and fertilizer materials. It attempts to explain and evaluate changes that have occurred in the industry in recent years as a result of increased availability of raw materials and changed marketing conditions for inedible tallow and grease. The results of the study give a better understanding of the problems that confront U. S. renderers and their ability to adjust to changes and furnish background information to serve as a basis for research into means of increasing efficiency in the production and marketing of inedible animal fats.

J. J. Gottsegen of the Industry Division, Bureau of the Census, made available the Census data upon which major phases of the report are based. These data are presented in such way as not to disclose the operations of individual renderers.

A companion report entitled "Rendering Inedible Animal Fats, Analysis of Practices in Pennsylvania and Minnesota," Marketing Research Report 283, was published in November 1958. It describes the collection, production, and marketing of fats in the two States for 1956.

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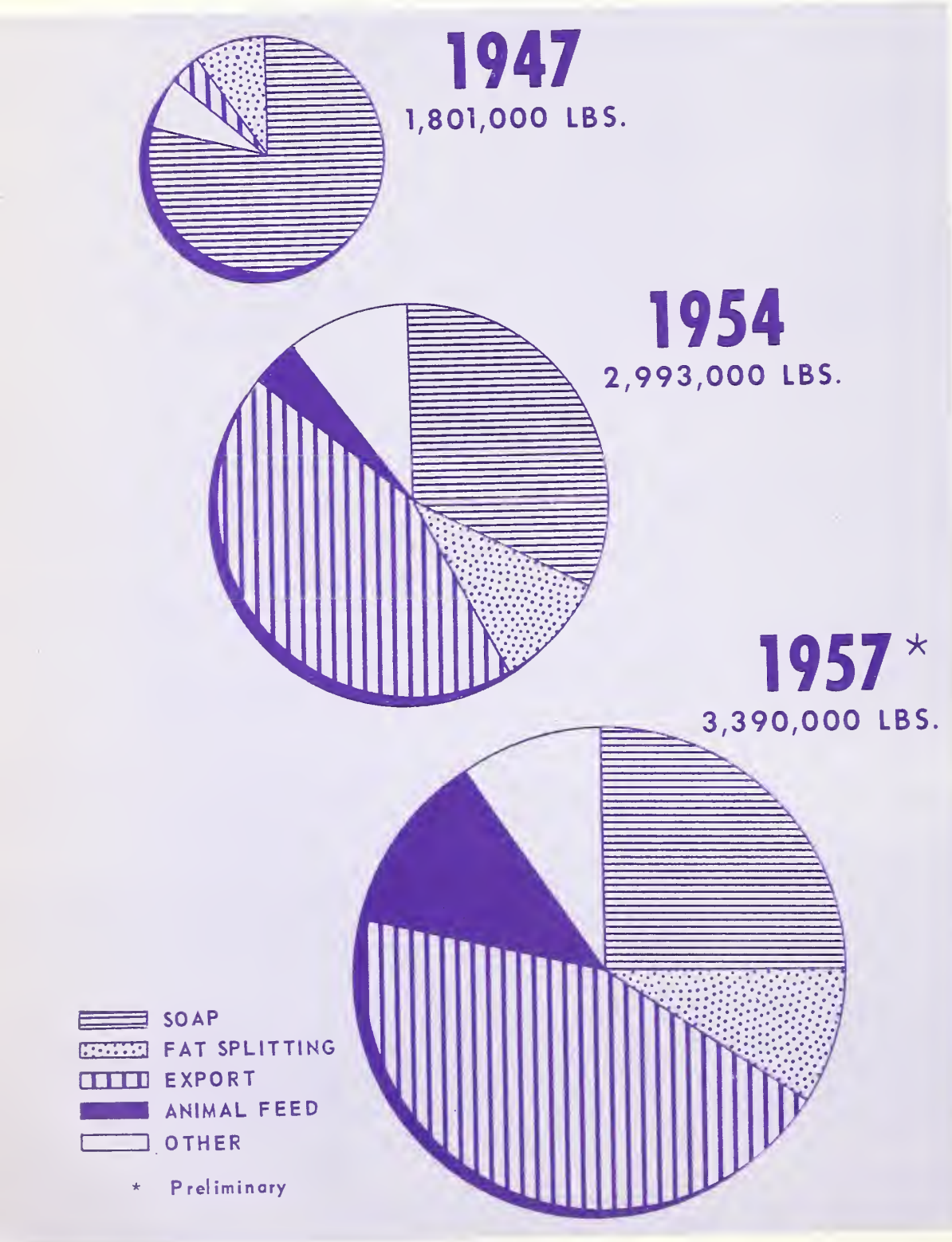

THE INEDIBLE TALLOW AND GREASE INDUSTRY: CHANGES IN MARKETS, PRACTICES, AND COSTS

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SUMMARY

Since 1949, the rendering industry has been confronted with the problem of finding markets for growing surpluses of inedible tallow and grease. The two principal factors that have contributed to this problem are (1) greatly increased production of inedible animal fats and (2) greatly decreased domestic demand.

The quantity of animal wastes salvaged for rendering has mounted along with increased livestock production and slaughter and the amount of tallow and grease produced per animal slaughtered Between 1949 and 1957 apparent production of tallow and grease went from 2.1 billion to 3 billion pounds

Until 1953, the principal outlet for inedible animal fats was the soap industry. This market began to decline in 1948 and consumption of tallow and grease in soap decreased from 1,500 million to 800 million pounds by 1957. During the same period synthetic detergent production rose from 600 million pounds to 3,500 million pounds. Since 1953, exports have been the principal market for inedible tallow and grease. In 1957, close to 45 percent of U. S. production, about 1,400 million pounds, was exported. Exports declined in 1958 to 1,115 million pounds. Consumption of tallow and grease in feed is the most important new use developed. In 1958, about 353 million pounds were mixed with high protein meals.

The rendering and the meat packing industries are the two principal producers of inedible animal fats. The proportion produced has shifted back and forth between these two industries. In 1957, renderers produced about 61.4 percent compared with 33.1 percent by the meat industry. About 5.5 percent was produced by other industries. In the Pacific and Northeast areas, renderers produce a larger proportion than meat packers. The reverse is true in the North Central States In 1954 over 63 percent of U. S. rendering plants were located in the Northeast and North Central States and they produced about 70 percent of the total tallow and grease output.

Rendering plants are found in almost every State in the U. S. There were 500 plants in operation in 1954, 56 plants less than in 1947. The reduction of 69 plants in the Northeast and North Central areas was greater than the U. S. total reduction. The South Atlantic and South Central States

gained 17 plants. Pennsylvania with 45, and Iowa with 44 have the largest number of rendering plants.

Rendering establishments range in size from 1 to over 500 employees. U. S. average employment per plant was 23 in 1954 about the same as in 1947. Over 70 percent of the rendering plants in operation, in 1954, had less than 20 employees and produced 24 percent of the total value of shipments. About 3 percent of the plants employed over 100 employees and accounted for 28 percent of the value of shipments, a decrease of 4 percent from 1947.

The total value of shipments for the rendering industry fell from 304 million dollars in 1947 to 222 million dollars in 1954. In 1957, the estimated value was 265 million dollars. Inedible tallow and grease represented 64 percent of the 1947 value of shipments compared with 47 percent in 1954. Feed and fertilizer byproducts accounted for 25 and 42 percent, respectively.

The average price per pound of tallow and grease received by renderers fell from 18.8 cents in 1947 to 6.7 cents in 1954. In 1957 prices averaged 7.4 cents per pound. Prices for meat scraps and tankage also decreased.

Prices vary among establishments and among areas because of differences in transportation costs, selling practices, and quality of products.

As the value of products declined, the rendering industry adjusted its operations to offset some of the decrease in returns. Substantial reductions were made in the cost of materials, labor, and power per ton of product between 1947 and 1954. Most of the reductions were in payments for raw materials which are related to the yield of the raw material and prices for products. The estimated average cost of raw materials, parts, containers, supplies, and contract work was reduced from about $120 to about $58 per ton of product between the two periods.

Substantial differences in costs were found among areas. In 1954, the costs of materials, fuel, electricity, and contract work were lowest in Minnesota, at 35 percent of the value of shipments, and highest in the Northeast at 62 percent. Labor costs were lowest relative to other costs in Illinois at 15 percent compared with 28 percent in Minnesota. Plants located in metropolitan areas, which were usually the large plants, reported costs for materials of over 58 percent of the value of shipments, whereas plants in rural areas reported costs below 50 percent In 1954, labor costs averaged higher for rural plants than for urban plants.

The average output per production man-hour also varied among areas. California reported the largest output per production man-hour. The output per man-hour was highest for plants paying the highest wages per production man-hour; however, there is a wide variation in the average value of shipments per man-hour among individual plants in all classifications.

To reduce the impact of low prices for tallow and grease and increased operating costs, the rendering industry can increase output per unit of cost and search for new and expanded markets. The industry made progress in adjusting operations to the changing market condition for its products between 1947 and 1954. The variation in the return per unit of product shipped by the industry and in the operating costs per unit indicate that further adjustments can be made by many renderers. Though prices are somewhat higher than they were in 1952 and 1953, domestic markets have not expanded as much as the production of tallow and grease has increased since 1954. Wage rates and other costs have continued to rise with the general increase in price level. Research is essential to the development of new markets for tallow and grease and is being supported by public and private funds outside the industry and by the rendering industry. These developments will be slow in coming. For the present, therefore, improved products and selling practices will benefit individual renderers most.

BACKGROUND AND OBJECTIVE

Rendering is the process by which tallow and other byproducts are obtained from animal raw materials. Some of these products, such as lard, are used for human food; others are inedible. The term "rendering plant" generally refers only to plants producing inedible products, the principal ones of which are inedible tallow and grease and feed and fertilizer material. 1/

Inedible tallow and grease are produced mainly by the meat packing and the rendering industries. Although rendering is a sideline for meat packers, it accounted for about 33 percent of the U. S. output in 1957. Most of the remainder, or about 61 percent, came from the rendering industry.

In 1957, the rendering industry shipped 265 million dollars worth of products. This is a decrease of 13 percent below the 1947 value of 304.5 million dollars.

Inedible products have a wide range of markets. Inedible tallow and grease are the principal raw materials used in the manufacture of soap. The demand for fats for soap making declined with the widespread acceptance of synthetic detergents as a substitute for soap. Utilization in soap manufacture nevertheless still is a sizeable market, totaling 727 million pounds in 1958. Prior to 1950, over 80 percent of the tallow and grease produced in the U. S. was consumed in the manufacture of soap.

Renderers continued to increase their output of tallow and grease despite the decline in their principal market, and their production rose from

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1/ Most feed and fertilizer byproducts produced by renderers are known as tankage and meat scraps. These are joint products with tallow and grease.

1 billion pounds in 1947 to 1.6 billion in 1957. The increase was mainly due to larger supplies of inedible animal wastes from increased livestock slaughter and increased accumulation of wastes by retail meat establishments and public eating places.

As production increased and domestic requirements declined, prices for products also declined. Inedible tallow and grease which averaged 18.8 cents per pound in 1947 was about 7.4 cents in 1957, and less than ½ cent higher in 1958. In 1947 tallow and grease returned renderers about 193 million dollars compared with about 118 million dollars in 1957. Prices for feed and fertilizer materials did not decline as much, and the industry increased its returns from these products by about 10 million dollars during the period due to increased production.

As a consequence, most of the industry found that despite their increased output, the total value of their shipments had declined substantially more than they were able to reduce the cost of materials and power between 1947 and 1954. This difference averaged $213,700 per plant in 1947 compared with $190,900 in 1954, a decrease of 11 percent. 2/ The greatest decrease between value of shipments and cost of materials and power occurred in plants with over 100 employees where it declined 37 percent, from $2,806,100 in 1947 to $1,780,900 in 1954. Increased labor costs further reduced the amount available to the renderer for such costs as depreciation, interest, insurance, rent, taxes, and other expenses, and for profit.

The welfare of farmers and consumers is affected by the extent to which renderers are able to salvage a large part of the raw materials available for rendering and to sell their products at a profit. Full utilization of agricultural products is related to returns to farmers and prices to consumers.

This study is a general economic investigation of important changes that have affected returns to renderers in recent years.

The analysis includes two phases: (1) A general economic evaluation of factors affecting production and markets for products, and (2) an analysis of the relationship between changes in costs and returns in the rendering industry.

The general analysis, which is based on secondary data, relates (1) increased livestock production, (2) decreased demand for tallow and grease in soap, (3) expanded exports of tallow and grease, and (4) other markets for inedible byproducts to production and prices. The analysis of plant operations is based largely on individual reports of renderers to the Bureau of the Census and deals primarily with the effects of size and location of

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2/ The difference between the value of shipments and cost of materials, parts, containers, supplies, fuel, electricity, and contract work is designated as "Value added by manufacture" by the U. S. Bureau of the Census. Value added covers labor, depreciation, interest, insurance, rent, taxes, profits, and other expenses.

rendering plants on costs. Special emphasis is placed on changes between 1947 and 1954, the dates of the last two Censuses of Manufactures. 3/ Some later data from the Annual Survey of Manufacturers taken by the Bureau of the Census are also used.

Nearness to raw material, types of raw material available, efficiency of labor, wage rates, fuel prices, electric power rates, efficiency of equipment, quality of products, availability of markets, and many other factors also have their effect on costs and margins of renderers. Attention will be called to these factors whenever they appear to have a significant effect on differences among plants of different sizes or in different locations.

THE PRINCIPAL PRODUCTS OF RENDERING

The primary products of rendering, inedible tallow and grease and feed and fertilizer material, accounted for 89.1 percent of the total value of rendering plant products in 1947 and 89.2 percent in 1954 (table 1). 4/ These two groups of products were of almost equal value to the renderer in 1954 when fats represented 47.1 percent and feed and fertilizer materials 42.1 percent of total shipments of 222.5 million dollars. Hides and glue are important secondary products. In 1954, hides returned 6.6 percent of the total value of shipments. Substantial amounts of glue and adhesives were also produced by some renderers. Glue and adhesives, other secondary products, and miscellaneous receipts amounted to 4.2 percent of the value of shipments.

Inedible Tallow and Grease

The fat produced by the rendering industry is known as inedible tallow or grease. These two products are not substantially different from their counterparts, edible tallow and lard. Their greatest difference lies in the type of material from which they are produced and conditions under which they are manufactured. Edible fats are rendered under sanitary conditions from selected fatty tissue and usually under the supervision of the Federal Meat Inspection Service. Inedible fats are rendered from discarded or rejected parts of animals, including fat, skin, lean meat, bones, offal, and so forth, generally with little regard for cleanliness. Because inedible fats are rendered from so much tissue other than fatty tissue, a proportionally large residual remains in the rendering tank after the fat is withdrawn. This residual is used as feed or fertilizer material.

The large amount of tissue that goes into the rendering tank has its effect on the quality of the fats that are produced. The tissue is likely

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3/ The 1958 Census is being taken in 1959.
4/ See table 20 for shipments by value by State and region.

Table 1.--Value of products of rendering establishments, 1947 and 1954

Item	1947		1954	
	Value	Percentage of total value	Value	Percentage of total value
	1,000 dollars	Percent	1,000 dollars	Percent
Primary products:				
Grease and tallow	193,248	63.5	104,721	47.1
Feed and fertilizer byproducts	78,035	25.6	93,748	42.1
Total	271,283	89.1	198,469	89.2
Secondary products:				
Hides, Skins and pelts	15,834	5.2	14,593	6.6
Other 1/	15,082	5.0	8,701	3.9
Total	30,916	10.2	23,294	10.5
Miscellaneous receipts: 2/	2,336	.7	753	.3
Total	304,535	100.0	222,516	100.0

1/ Principally glue and adhesives.
2/ Contract work, repair work, and other.

Reports 1947 and 1954, U. S. Censuses of Manufactures.

to affect the color, moisture, and free fatty acid content and, therefore, its market value. It is possible to produce fats from selected clean, inedible raw materials properly cooked that cannot be distinguished from the edible product. In general practice, however, a quite different product is obtained. Grease and tallow resembling the edible products are required to be decharacterized by the addition of a special denaturing agent and all inedible fats must be properly labelled inedible in interstate shipment.

Renderers are aware that the better the quality of fat they produce the better return they will receive, but standards for inedible tallow and grease are not clearly defined and the renderer is often not in a position to make the best use of the standards of practice in trading. The standards of evaluation for these fats that are presently being used as a guide by producers and buyers were set up by the U. S. Office of Price Administration (5, p. 15) 5

5/ Underscored figures in parentheses refer to Literature Cited, p. 37.

during World War II. 6/

The characteristics of greatest importance under today's trading practices are titer; free fatty acid content; moisture, impurities, and unsaponifiable matter (M.I.U.); color; and bleachability. 7/ Chemical analysis is necessary to determine these characteristics accurately. These standards were developed largely to furnish fats of desirable characteristics to the soap industry.

In order to produce the best products possible, raw materials should be separated, cleaned thoroughly, and cooked properly. Many renderers are not able to follow good rendering practices, however, because they do not have adequate facilities. Often all of the raw material must be cooked at one time, for example, a batch or two a day. To hold some of it aside for the second cooking might have an even more adverse effect on products because of rapid deterioration of animal wastes. Also, many renderers have a single storage tank for tallow and grease to which each batch is added as it is cooked. Most renderers, however, can follow good cleaning and cooking practices. Color serves as a valuable measure of quality in the product.

The Bureau of the Census reported tallow and grease separately until 1955. Historically, reports have shown tallow production to be about twice that of grease. In practice probably no lot of fat, strictly speaking, is either tallow or grease by origin. The renderer fills his cooker with whatever raw material is available, which usually is a combination of beef, lamb, pork, or even poultry materials. When the quantity of beef and lamb available is sufficiently large in relation to other byproduct waste, the result will be a product classified as tallow. With such large quantities of pork fat going into lard, tallow is likely to exceed grease in the combination; hence the relatively greater tallow production.

Feed and Fertilizer Byproducts

When commercial rendering was first developed, inedible animal wastes were rendered for the fats they contained. A market for the residue of the rendering operation came later with its use as an ingredient of commercial fertilizer. Search for more profitable uses for the residue led to its incorporation into animal feed beginning about 1900. Today about 90 percent of the residue is used for animal feed (table 2).

6/ Under the Commodity Exchange Authority tallow futures were sold between June 26, 1935, and June 5, 1941, and since August 1, 1956. This market, which sets up certain trading requirements would tend toward standardization. Very little use, however, has been made of the futures market. Some trading rules have been set up by the West Coast renderers for fats for export.

7/ The titer, or hardness, of the fat is the characteristic that determines whether the product is tallow or grease. Fats with a melting point at 40° C. or higher are tallow and those below are grease. Tallow generally is produced from beef and sheep or lamb fat and is characteristically a hard or high titer fat whereas grease comes largely from pork fats and is a soft or low titer fat. Poultry fats are also soft fats.

Table 2.--Shipments and interplant transfers of feed and fertilizer materials from animal byproducts, by quantity and value, for total United States, and renderers, 1954 1/

Commodity	Total United States				Renderers			
	Quantity	Value	Percentage of total		Quantity	Value	Percentage of total	
			Quantity	Value			Quantity	Value
	Tons	1,000 dol.	Pct.	Pct.	Tons	1,000 dol.	Pct.	Pct.
Feeds	1,389,751	127,417	89.1	90.5	777,350	71,041	89.7	90.9
Fertilizer	2/ 169,612	13,373	10.9	9.5	89,377	7,099	10.3	9.1
Total	2/1,559,363	140,790	100.0	100.0	866,727	78,140	100.0	100.0

1/ Does not include feed and fertilizer materials for which the use has not been specified. Of this group wet tankage is the most important.
2/ Revised data.

Based on the 1954 U. S. Census of Manufactures.

Feed and fertilizer materials produced by renderers are commonly known as wet and dry tankage, meat scraps, and bone and blood meal. The process used is largely responsible for differences in designation between tankage and meat scraps. Two types of rendering are in common use--wet and dry rendering--and they result in somewhat different residues or products. Two products besides the fat are obtained from the wet rendering process: (1) Tank water and (2) a semi-solid residue. The residue is pressed to remove the moisture and the fluid is evaporated to a molasses-like consistency known as stick. The two are mixed and dried to produce what is commonly called digester tankage. Whatever part of the digester tankage produced is not readily marketable for feed goes into fertilizer.

Dry rendering, which was introduced in 1914, was considered a major step forward in the rendering of inedible animal byproducts. The term "meat scraps" is usually applied to the ground, screened, dry rendered tankage. Those renderers who do not have milling equipment with which to produce meat scraps sell their dry rendered tankage to those who do.

While it is generally understood that meat scraps, meat meal, and bone meal are processed from dry rendered tankage, products known as meat meal tankage, feeding tankage, digester tankage, digester tankage with bone meal, meat and bone meal digester tankage, meat and bone meal tankage, and feeding tankage with bone meal are processed from both wet and dry rendered tankage. These products, when ready for market, are of widely varying quality. Just as the value of the grease produced by renderers depends on the quality and condition

of the raw material and regulation of cooking conditions, so does the quality of tankage and meat scraps. The amount of dirt, manure, hair, and other indigestible materials contained is important in determining its value as an animal feed.

Feed products are sold on a protein basis and fertilizer on a nitrogen basis. Other characteristics vary with renderers, and it is the practice of buyers to become familiar with the product of their suppliers and establish their paying prices on that basis

Because of these variations among rendered products, there is a wide variation in prices among plants (table 3). In 1947, f.o.b. shipping point returns for grease varied between 15 and 32 cents per pound in the East North Central States and that for inedible tallow between 7 and 26 cents. In 1954 prices for grease varied from 4.9 to 7 cents and for tallow between 4.4 and 7.4 cents in the same region. Similar differences are found in the prices for meat scraps for feed. The range for the same region was between $44 and $167 per ton in 1947 and $70 and $165 in 1954. In addition to quality variation, some price differences can be assigned to the stage of processing in which the product is marketed. Transportation or nearness to market and selling practices also affect prices.

Table 3.--Range of realized prices (f.o.b. plant) for inedible animal fats and feed byproducts sold by renderers by region, 1947 and 1954 1/

Region	1947			1954		
	Inedible fats		Feed byproducts	Inedible fats		Feed byproducts
	Grease	Tallow	Meat scraps	Grease	Tallow	Meat scraps
	Ct./lb.	Ct./lb.	Dol./ton	Ct./lb.	Ct./lb.	Dol./ton
New England	15-31	17-26	89-121	5.5-7.0	6.5-7.2	50-102
Middle Atlantic	10-24	13-32	30-225	5.5-7.8	4.4-9.9	46- 99
East North Central	15-32	7-26	44-167	4.9-7.0	4.4-7.4	70-165
West North Central	10-39	14-24	11-178	3.0-8.4	4.8-7.4	81-121
South Atlantic	10-24	16-26	9-112	3.1-6.8	5.5-7.6	75- 98
East South Central	2-58	10-21	70- 74	4.8-6.0	4.9-6.5	72- 97
West South Central	12-25	11-28	10-111	4.9-8.6	5.5-12.5	77-100
Mountain	10-22	14-20	82-157	4.8-6.4	2.6-6.5	84-104
Pacific	16-21	12-36	40-144	3.7-7.6	6.2-8.0	88-154

1/ Realized prices for products are the received net selling values, f.o.b. plant, after discounts and allowances and excluding freight charges and excise taxes.

Based on the 1947 and 1954 U. S. Censuses of Manufactures.

Other Products

About 60 percent of all renderers handle hides which are usually acquired from the salvage of fallen animals. The hide is often the most valuable product obtained from an animal and is likely to be the reason the renderer collects fallen animals.

Glue is also a byproduct of the rendering process. It is obtained by dehydrating the fluid (tank water) obtained from the wet rendering process.

Product Specialization

Although tallow and grease and meat scraps and tankage are joint products of the rendering process, proportionally more fats than feed and fertilizer materials are produced by some renderers than by others (table 19).* In 1947 there were 406 plants that obtained 50 percent or more of the total value of their shipments from tallow and grease compared with 169 in 1954. What appears to be a shift in production between these two products is largely a change in the relative level of prices for the commodities. Since 1947 prices for fats decreased much more than for meat scraps and tankage because of the failure of the demand for fats to keep up with supplies.

Some renderers may have made relatively greater gains in the output of meat scraps and tankage than in the output of tallow and grease. Data are not available for an accurate determination of the output of feed and fertilizer byproducts. With relatively good prices for these materials and rising operating costs, meat scraps and tankage that were previously wasted were likely to have been salvaged. Tallow and grease, however, are more valuable per unit of product than meat scraps and tankage; therefore, the renderer usually finds it more profitable to obtain the maximum amount of fats from the rendered byproducts at the expense of his volume of output of meat scraps and tankage. The proportion of fat in the raw material and the type of equipment used to extract the fat from the residue also affect the relative proportion of the two types of products produced.

There are some important differences among establishments producing higher percentages of fat than of feed and fertilizer byproducts. Rendering plants with greater specialization in animal fats employed more people than those with greater specialization in feed and fertilizer byproducts. On the other hand, plants with 90 to 100 percent specialization in fats had relatively small average employment. Small plants often do not have facilities to make the best use of the raw material they render. Some sell partially processed feed and fertilizer materials directly to farmers. Others must render whatever materials are available and produce fats of poor quality which bring low prices. Sometimes these fats must be further processed by another plant before final use.

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* Tables 11 through 23 are in the appendix.

Material and power costs, which are somewhat higher in the plants specializing in meat scraps and tankage, may result partly from the procurement of materials such as grains and high protein cracklings for mixing with their products to obtain more marketable products.

PRODUCTION TRENDS AND MARKETS

Tallow and Grease

Production and Markets

The upward trend in total U. S. production of inedible animal fat over the past 20 years can be readily observed from figure 3. In 1937 about 855 million pounds of tallow and grease were produced, compared with 3,080 million in 1958. Important gains have been made in recent years. Between 1954 and 1957, production went from 2,679 million pounds to 3,080 million. 8/ In 1958 it was about 340 million pounds below 1957.

Except for the two inflationary peaks which occurred with the removal of ceiling prices following World War II and again during the Korean conflict, the trend in the price of these products has shown little upward movement since 1942 until 1954 when the export market began to absorb substantial quantities of fats and oils.

Inedible tallow prices have been at a low level for the past 6 years. The lower prices that have continued since 1949, except for the period of hostilities in Korea, indicate that a new market situation prevails for the tallow and grease industry. Surpluses began to accumulate in 1949, due to the upward trend in production of tallow and grease and the decline in the demand for use in soap. Exports have forestalled the accumulation of large stocks but demand has not been such as to lift prices much above 7 cents per pound. Continued production of tallow and grease at these prices requires greater efficiency in production and distribution to make operation of a rendering plant profitable, and to afford an adequate market for farmers and those who sell inedible animal byproducts.

Prior to 1944, inedible tallow prices were close to vegetable oil prices, while lard prices generally averaged higher. From 1944 on, vegetable oil and lard prices have been 3 to 5 cents a pound higher than tallow prices. Improved oil processing techniques were responsible for much of the increased demand for vegetable oils for edible purposes. In 1957 tallow prices averaged almost 6 cents per pound less than the edible fats and oils, lard, and soybean and cottonseed oil. In February 1959 the differential was only about 3 cents per pound because of the decline in edible oil prices. With tallow and grease output likely to increase, only a high level of exports and substantial increases in the use of tallow and grease in feed or some other new use will maintain prices near current levels.

8/ "Apparent production;" see table 23.

Markets for Tallow and Grease

Besides soapmaking, the principal domestic uses for tallow and grease are in animal feed mixing, and for fat splitting (table 23). Fat splitting has shown an upward trend in the last few years, reaching 284 million pounds in 1957, an increase of 20 percent over the 1943-57 average. Tallow and grease in an amount about equal to that which is split finds its way into other products such as lubricants, paint and varnish, and printing ink.

The most promising new markets for the use of tallow and grease are in animal feed and as plasticizers. Use in animal feed appears likely to become the most important market because it can absorb large volumes of fat to very good advantage. Their use as a plasticizer is being studied and developed and may become a considerably important market. Today, however, the major market for inedible animal fats is the export market.

The Soap Market for Inedible Animal Fats

The need for large quantities of cheap fats for use in soapmaking, no doubt, was a major factor in the development of the rendering industry. This market is now threatened because of the successful development of a new group of cleaning agents known as synthetic organic detergents (fig. 1). Synthetic detergents appeared during the 1930's and they have had a rapidly expanding market since the mid-forties. 9/

Manufacturers' reports to the Bureau of the Census show that detergent manufacturers reduced their shipping price for granulated, powdered, and sprayed detergents from an average of 34.5 cents per pound in 1947 to 20.3 cents in 1954. This decrease put the price of detergents at the same level as the price of granulated sprayed soap powders which averaged 20.1 cents per pound in 1947 and 20.4 cents in 1954. These, presently, are the most competitive items. Soap flakes averaged 29.1 cents per pound in 1947 and 29.4 in 1954.

Animal and vegetable fats and petroleum can all be used in the manufacture of detergents. However, according to recent estimates, petroleum-derived synthetic detergents cost less to produce than those derived from animal and vegetable fats and oils (10, pp. 7-8). Most of the synthetic detergents being produced are petroleum based.

Use of inedible tallow and grease in the production of all the synthetic organic detergents produced in 1956 would have required about 600 million pounds of these fats. Although this is a very important quantity, it would

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9/ The terms detergent, synthetic detergent, and synthetic organic detergent as used in this report apply to the recently developed group of surface active agents, not including soap, which are used for the same purposes for which soap is used.

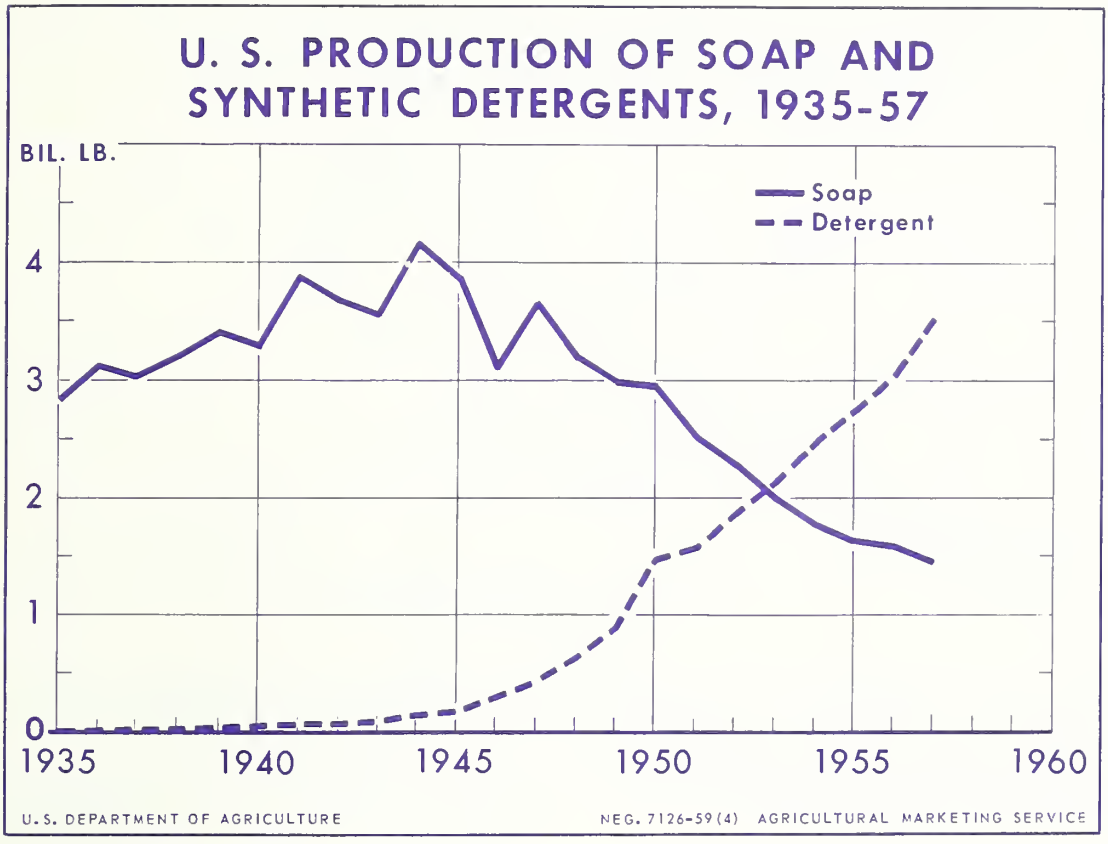

Figure 1

still have left a surplus of major proportions. Since the synthetic detergent industry has geared its production to petroleum-based detergents, petroleum will probably continue its favored position for some time. It is true that prospective abundant supplies of inedible tallow and grease at relatively low prices have put tallow and grease in a favorable position to compete for a share of this market; however, because of the variation in quality of animal fats, research is needed to make their use more attractive.

The effect of the demand for synthetic detergents on the use of inedible tallow and grease in soap is illustrated by figure 2. In 1942 about 88 percent of the U. S. production was consumed in the manufacture of soap compared with about 27 percent in 1958. This represents an increase in the difference between production of inedible tallow and grease and the consumption of these fats in soap from 0.2 billion pound in 1942 to 2.3 billion pounds in 1957.

The chief market in which synthetic detergents have not as yet made much headway is the toilet soap field. This is due to the stronger defatting characteristic which is so acceptable for laundry purposes but which is not

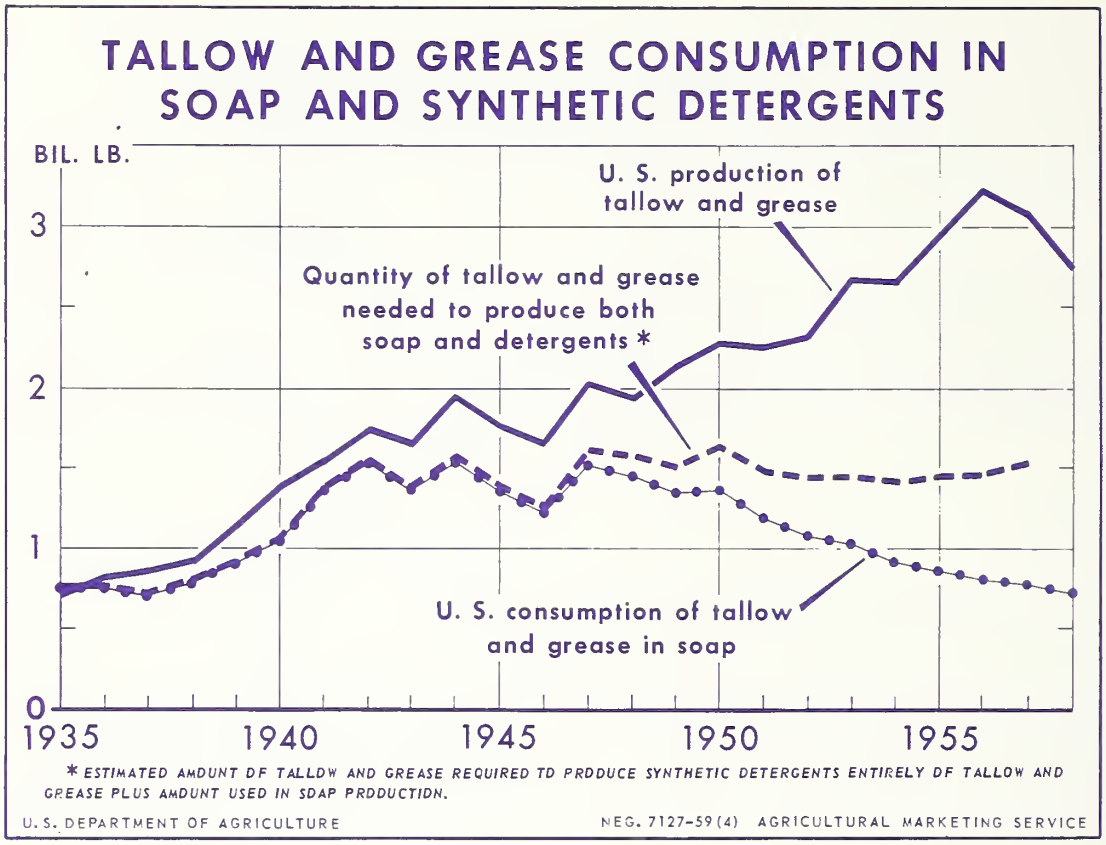

Figure 2

acceptable in a toilet article. Should experiments produce detergent toilet soap mild enough for use on the skin, it will cut into this last stronghold of the soap market. The production of soap decreased from 3.3 billion pounds in 1947 to 1.5 billion pounds in 1954 (table 4). Future prospects are that the rendering industry will have only a small specialized soap market for the inedible fats it produces if a synthetic detergent is developed superior to toilet soap.

Foreign Trade in Tallow and Grease

World production of tallow and grease was estimated to be 6,250 million pounds in 1958, about 200 million less than the 1957 peak of 6,450 million pounds but twice the 1935-39 average (13, p. 9 and 14, p. 11). The leading producers of tallow and grease, aside from the United States, are, in order of importance, Argentina, Australia, United Kingdom, France, and Canada. The United States accounted for about 51 percent of the world total, and Argentine production was equal to about 6 percent of the world's production.

Table 4.--Production of soap, by types, 1939, 1947, and 1954

Type of soap	1939		1947		1954	
	Quantity	Percentage of total production	Quantity	Percentage of total production	Quantity	Percentage of total production
	Million pounds	Percent	Million pounds	Percent	Million pounds	Percent
Toilet	409	13.8	566	17.2	521	34.6
Laundry bars	1,240	41.9	765	23.2	288	19.2
Chips, flakes, granulated, powdered, and sprayed	1,312	44.3	1,969	59.6	695	46.2
Total	2,961	100.0	3,300	100.0	1,504	100.0

From the U. S. Census of Manufactures.

World exports of tallow and grease also have increased materially, going from 760 million pounds in 1951 to approximately 1,950 million pounds in 1958. Most of the gain occurred in U. S. exports which increased about 156 percent between 1951 and 1958. Presently the U. S. accounts for nearly 72 percent of the world trade in tallow and grease. Australia, New Zealand, and Canada are the only other countries having exports of commercial importance.

The demand for U. S. tallow has increased largely because of its relatively low prices. Western Europe, Italy, and Japan have been the largest foreign markets. Japan and West Germany are producing synthetic detergents and, no doubt, this industry will grow. Many foreign countries, nevertheless, will have need of fats for soap for some time if sales can be arranged. U. S. Government programs have been important in promoting this trade. These programs include trade fairs and other trade promotion practices as well as Government financed sales. Between July and December 1958 about 7 percent of the U. S. exports of tallow were financed under specified Government programs (15, p. 1).

The Use of Animal Fats in Feeds

The most significant development in recent years in the use of inedible tallow and grease is the combination of these fats with feeds. This practice promises to absorb more fats than any other developed so far. Experiments to evaluate the nutritional advantage of adding fats to animal feeds were begun in 1952. These experiments have reported exceptional results in increased feed efficiency and high level of performance for feeds with added fat.

Many important advantages are claimed for feeds that have added fats. Among those most often mentioned are: (1) Increased palatability--that is, animals prefer the feed containing fat when they have a choice; (2) control of dustiness which is helpful in handling, storage, and consumption; (3) improved appearance; (4) increased vitamin stability; (5) reduced wastage and fire hazard from dust; and (6) increased feed efficiency (2, pp. 12-20).

The cost of fats in relation to other sources of energy is an important factor in the demand for these ingredients in feed mixing (3, pp. 17-22). The present low market value of tallow and grease has been a major factor in the rapid increase in its use.

The quality of fats used for feed mixing is important to the future development of this market. Fats with excessive free fatty acid become rancid and cause feed to become unpalatable and to lose some of its nutritive value. Rancidity promotes the destruction of vitamins. The Federal Meat Inspection Service has issued regulations permitting use of a number of different antioxidants in a limited amount to preserve the quality of fats to be used in animal feed.

Feed manufacturers have converted to the mixing of fats with feed at a very rapid rate. In 1952 it was estimated that about 10 million pounds of fat went into animal feed. For the year 1956, it was reported by 1,918 feed mixing plants that about 324 million pounds of fats were mixed in feeds, 300 million pounds of which were inedible tallow and grease (5, p. 4). Bureau of the Census reports indicate continued increased usage in 1957.

With an estimated annual production of about 35 million tons of commercially bagged feed, enrichment of that amount of feed with only 2 percent fat would utilize 1.4 billion pounds of fat annually. 10/ Addition of that amount would have absorbed most of the 1957 U. S. surplus production (table 23).

Some renderers are adopting the practice of tailoring their inedible tallow and grease production to meet the needs of a feed-mixing plant. The feed mixer can then depend upon having available a supply of fat of suitable quality and the renderer will have a ready market for his product. It may also be possible to make special arrangements for handling fats. For example, the practice of hauling the rendered fat directly from the settling tank to the feed plant in many cases would reduce handling, storage,and transportation requirements. Indications are that most of the present commercial grades are suitable for feed mixing (9, pp. 411-14). Addition of fat to feed is a simple mixing process and does not require expensive complicated equipment. Almost any existing type of feed mixer can be used (16, pp. 15-22).

Feed and Fertilizer Byproducts

The production of meat scraps and tankage has been increasing along with the increasing output of tallow and grease. This is to be expected since they are joint products.

10/ Industry estimate of annual production of commercially bagged feed without allowance for custom mixing.

In the 1954 Census of Manufactures, tankage was reported as wet tankage and dry tankage. Table 5 indicates that the meat industry sells or transfers to a subsidiary comparatively large amounts of wet tankage while the rendering industry sells proportionally more meat scraps. Since wet tankage requires more processing than meat scraps and dry tankage, the value per ton averages only about one-half that of meat scraps and dry tankage. The practice of selling wet tankage and semi-finished meat scraps (dry tankage) indicates that many producers find that the advantage of not having to carry on the additional activities necessary to dry and mill the tankage is sufficient to overcome the lower market value of the unfinished products.

The tankage and meat scraps not suitable for animal feed are mixed into fertilizer. Whether the renderer can sell his meat scraps and tankage to a feed mixer or will have to let them go for fertilizer is often very important. The average value for these products used in feed was $92 per ton in 1954 compared with $79 for those used as fertilizer materials. Most of the States report a substantial price difference between the two uses. The values per ton shown in table 21 represent the average value of products at different stages in the process of manufacture of the final product.

The Market for Meat Scraps and Tankage in Feed

Meat scraps and tankage are especially valuable as a high protein feed supplement and as such compete with other high protein feeds including soybean and cottonseed meal, skim milk, and grain proteins. About 70 percent of the protein feeds available are the oilseed meals. By 1956 the use of tankage and meat scraps for feed had increased by 150 percent over the 1935-39 average. This increase was not as great as the increase in the use of oilseed meal which rose about 210 percent during the period; however, it represents 90 percent of the material produced by the rendering and other industries and perhaps all of the products suitable for this use.

Meat scraps and tankage are used chiefly as a protein supplement for swine and poultry feeding. The "animal protein factor" or growth factor essential in swine and poultry feeding is found naturally in meat scraps, fish meal, and dried milk (6, pp. 12-13).

Although meat scraps and tankage are sold on a protein basis, they have the additional advantage, over oilseed meals, of containing larger amounts of phosphorous, calcium, and important vitamins. The addition of vitamin B12 to vegetable meals makes them more competitive in this respect with animal by-product feeds.

The rapidly growing mixed-feeds industry represents a growing market for high protein feed supplements. One of the major objections to the use of meat scraps and tankage for animal feed is the variability in quality due to improper selection, handling, and processing of raw material. Quality control is an important step toward improvement of the market for meat scraps and tankage.

Table 5.--Shipments and interplant transfers of feed and fertilizer materials, by kind, U. S. total, and by industry, 1947 and 1954

Year and commodity	All industries		Renderers				Meatpacking and other industries			
	Quantity	Value	Quantity	Value	Percentage of all industries: Quantity	Percentage of all industries: Value	Quantity	Value	Percentage of all industries: Quantity	Percentage of all industries: Value
	Tons	1,000 dollars	Tons	1,000 dollars	Percent	Percent	Tons	1,000 dollars	Percent	Percent
1947:										
Meat scraps 1/	640,848	63,111	---	46,328	---	73.4	---	16,783	---	26.6
Bone meal	124,231	8,254	---	3,414	---	41.4	---	4,840	---	58.6
Other and unknown 2/	---	87,173	---	26,239	---	30.1	---	60,934	---	69.9
Total	---	158,538	---	75,981	---	41.6	---	82,557	---	58.4
Unspecified	---	7,675	---	2,054	---	26.8	---	5,621	---	73.2
Total	---	166,213	---	78,035	---	46.9	---	88,178	---	53.1
1954:										
Meat scraps	1,010,345	92,692	679,298	62,530	67.2	67.5	331,047	30,162	32.8	32.5
Bone meal	116,036	8,038	31,807	2,008	27.4	25.0	84,229	6,030	72.6	75.0
Tankage--wet 3/	419,974	18,680	95,599	5,912	22.8	31.6	324,375	12,768	77.2	68.4
Tankage--dry	315,919	28,277	137,259	11,827	43.4	41.8	178,660	16,450	56.6	58.2
Other 4/	5/ 117,063	11,783	18,363	1,775	15.7	15.1	98,700	10,008	84.3	84.9
Total	1,979,337	159,470	962,326	84,052	48.6	52.7	1,017,011	75,418	51.4	47.3
Unspecified	---	13,199	---	9,696	---	73.5	---	3,503	---	26.5
Total	---	172,669	---	93,748	---	54.3	---	78,921	---	45.7

1/ Meat scraps used for feed. Data for other uses not available.
2/ Includes wet and dry tankage, meat scraps, bone meal, and unknown.
3/ Tankage, animal refuse and garbage.
4/ Includes blood meal.
5/ Revised.

Note: 1947 data are not directly comparable to 1954 data because of some differences in classification.

Compiled from the 1947 and 1954 Censuses of Manufactures.

Since 1935, the wholesale price per unit of protein in tankage and meat scraps has been fairly close to that for protein in soybean and cottonseed meal, with prices for protein in tankage and meat scraps tending to be slightly higher. This differential, however, has decreased since 1950 and, at times, the price of protein in oilseed meal has exceeded that in animal byproducts.

The Market for Meat Scraps and Tankage in Fertilizer

The chemicals contained in tankage and meat scraps which are important to the fertilizer industry are nitrogen, phosphorus, and potassium. The value of tankage and meat scraps for use in fertilizer is dependent upon the amounts of these three materials they contain. Over 13 million dollars worth of animal byproducts, including bone and blood meal, were used in fertilizer manufacture in 1954 (table 2). These products represent less than 3 percent of the total cost of materials used in commercial fertilizer production.

This market, however, may be important to many small renderers who do not have facilities and raw material of a quality to produce tankage or meat scraps suitable for use in animal feeds.

Hides, Skins and Pelts

Although market prices of hides fell about 55 percent between 1947 and 1954, the total value of hides, skins and pelts produced by renderers fell by only 8 percent (table 1). Between these two years, cattle slaughter increased about 16 percent which indicates that the rendering industry increased the number of hides salvaged proportionally more than other producers of hides. Using average prices, it is estimated that renderers probably processed twice as many hides in 1954 as in 1947. Hide prices have continued downward since 1954 because of the declining demand for leathers. It is likely that increased operating costs and declining prices for hides and pelts has discouraged some renderers from continuing to process hides.

THE RENDERING INDUSTRY

Development

Rendering was largely a home industry until the middle 1800's. It was not until the slaughtering and meatpacking industries began to develop and the need arose to dispose of slaughterhouse wastes in a sanitary and economical manner that rendering inedible animal byproducts was developed commercially.

In the beginning slaughterers and meatpackers generally were not interested in the salvage of inedible byproducts except hides; consequently satellite industries grew up in the vicinity of slaughterhouses to make use of these wastes. Among these industries was the rendering industry (17, p. 177), (1, pp. 2-3), and (4, pp. 309-10).

Integration of slaughtering with meatpacking followed and led to the absorption of many of the satellite byproduct plants by the meat industry in order to gain the economic advantage of internal economies (17, p. 177). By 1914 about 67.9 percent of the U. S. tallow and grease production came from slaughter and meatpacking establishments (table 6).

Table 6.--Percentage of inedible tallow and grease produced by different industries, 1914-58 1/

Year	Renderers	Meatpackers	Other 2/
	Percent	Percent	Percent
1914	29.3	67.9	2.8
1919	31.4	63.1	5.5
1921	51.7	44.4	3.9
1923	50.1	46.1	3.8
1925	43.4	50.4	6.2
1927	47.8	46.1	6.1
1929	48.1	46.9	5.0
1931	49.5	46.8	3.7
1935	45.8	3/48.2	3/6.0
1937	49.9	3/45.1	3/5.0
1939	49.7	44.3	6.0
1947	53.4	39.6	7.0
1954	55.2	38.8	6.0
1955	4/56.9	37.1	4/6.0
1956	4/57.3	36.7	4/6.0
1957	4/61.4	33.1	4/5.5
1958	4/61.3	33.2	4/5.5

1/ Percentage based on quantity 1914-23 and 1955-58, and on value 1925-54.
2/ Glue and gelatine, feed and fertilizer mixing plants, and other animal byproduct industries.
3/ Breakdown between meatpackers and other estimated.
4/ Breakdown between renderers and other estimated.

Estimates based on (1) the 1914-54 U. S. Censuses of Manufactures and (2) Facts for Industry, Animal and Vegetable Fats and Oils, Series M 17-1, U. S. Bureau of the Census, 1955-58.

But, by 1921 the proportion of inedible animal fats produced by the meat industry had fallen to less than 45 percent. The consent decree 11/ entered February 12, 1920, against 5 large packers may have helped to bring about this

11/ The consent decree was entered in restraint of monopolistic practices following the Report of the Federal Trade Commission on the Meat-Packing Industry, June 28, 1919.

change (17, p. 183). Between 1923 and 1954 the gradual trend continued toward greater gains in production of tallow and grease by the rendering industry than by the meat industry. The total proportional increase for renderers was about 7 percent and the decrease for meatpackers was about the same.

In 1954 renderers produced 55.2 percent of the U. S. total production of tallow and grease and meatpackers about 38.8 percent. This trend has continued through 1957. Approximately 6 percent is produced by other industries which include glue and gelatine plants, feed and fertilizer plants, leather manufacturers, and other byproduct industries.

The proportion of rendering done by each industry varies among regions. In the New England and Middle Atlantic States, most of the production of inedible rendered products come from the rendering industry while in the East and West North Central States a much larger proportion comes from the meatpacking or allied industries (table 20). The two extremes are New York, where renderers produce 82 percent of the State's inedible tallow and grease and 88 percent of its feed and fertilizer materials, and Minnesota, where 81 percent of its tallow and grease and 80 percent of its feed and fertilizer materials is produced by slaughterers and other industries. This is largely the result of differences in volume of livestock slaughtered between the two areas. The Midwest, which has a large slaughtering industry, would normally find that rendered inedible byproducts would come from that industry (fig. 3).

Size and Growth

In 1947, inedible animal byproducts were produced by about 1,230 meatpacking establishments that rendered inedible animal wastes, 556 rendering plants, and approximately 65 manufacturers of glue, gelatin, feed, fertilizer, leather, or allied products. 12/ By 1954 only about 775 establishments in the meat industry, 500 rendering establishments, and 40 establishments in other industries produced these products.

During the two World War periods, rendering to supply inedible fats for soap and munitions assumed a great deal of importance. Immediately following World War I there was a sharp drop in the number of rendering plants. In 1933 only 201 establishments reported to the Bureau of the Census. The decline following World War II was not as sharp as that following World War I; however, a moderate reduction in the number of plants in operation is continuing at the present time.

Location of Plants

Although rendering plants can be found in almost every State in the U. S., the major part of the industry is concentrated in the Northeast and North Central States. In 1947, there were 386 of a total of 556 rendering plants located in these regions and approximately 80 percent of the tallow and grease

12/ Revised 1947 data reports 554 rendering plants.

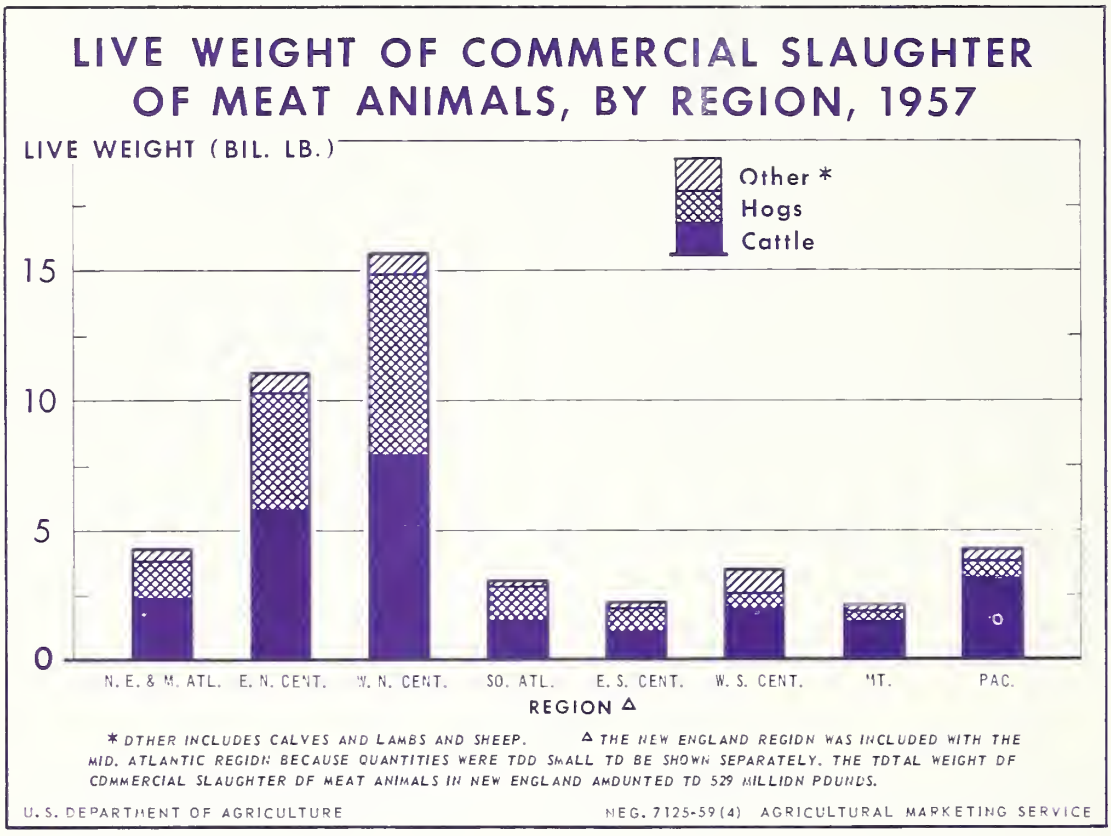

Figure 3

produced by renderers originated in them. This compares with 317 plants in 1954 and 70 percent of the production. Since the availability of an adequate and continuous supply of raw materials is such an important factor in the location of rendering plants, it is to be expected that many plants would be built in heavy livestock producing and slaughtering areas and in the vicinity of concentrations of population to collect the wastes from the numerous meat markets, institutions, and eating establishments (fig. 4).

Both the Northeastern States and the North Central States reduced the number of rendering establishments in operation between 1947 and 1954. This reduction amounted to 15 percent or 20 plants in the Northeast and 20 percent or 49 plants in the North Central States, compared with a total U. S. reduction of 56 plants between these two years (table 7). The South Atlantic and South Central States gained 17 plants and the Pacific area gained 2 plants, between 1947 and 1954. 13/

13/ Small numerical differences between the two Census reports (1947 and 1954) may arise because of the procedure used for classifying industries and because of reporting errors. (See appendix for the definition of an industry.)

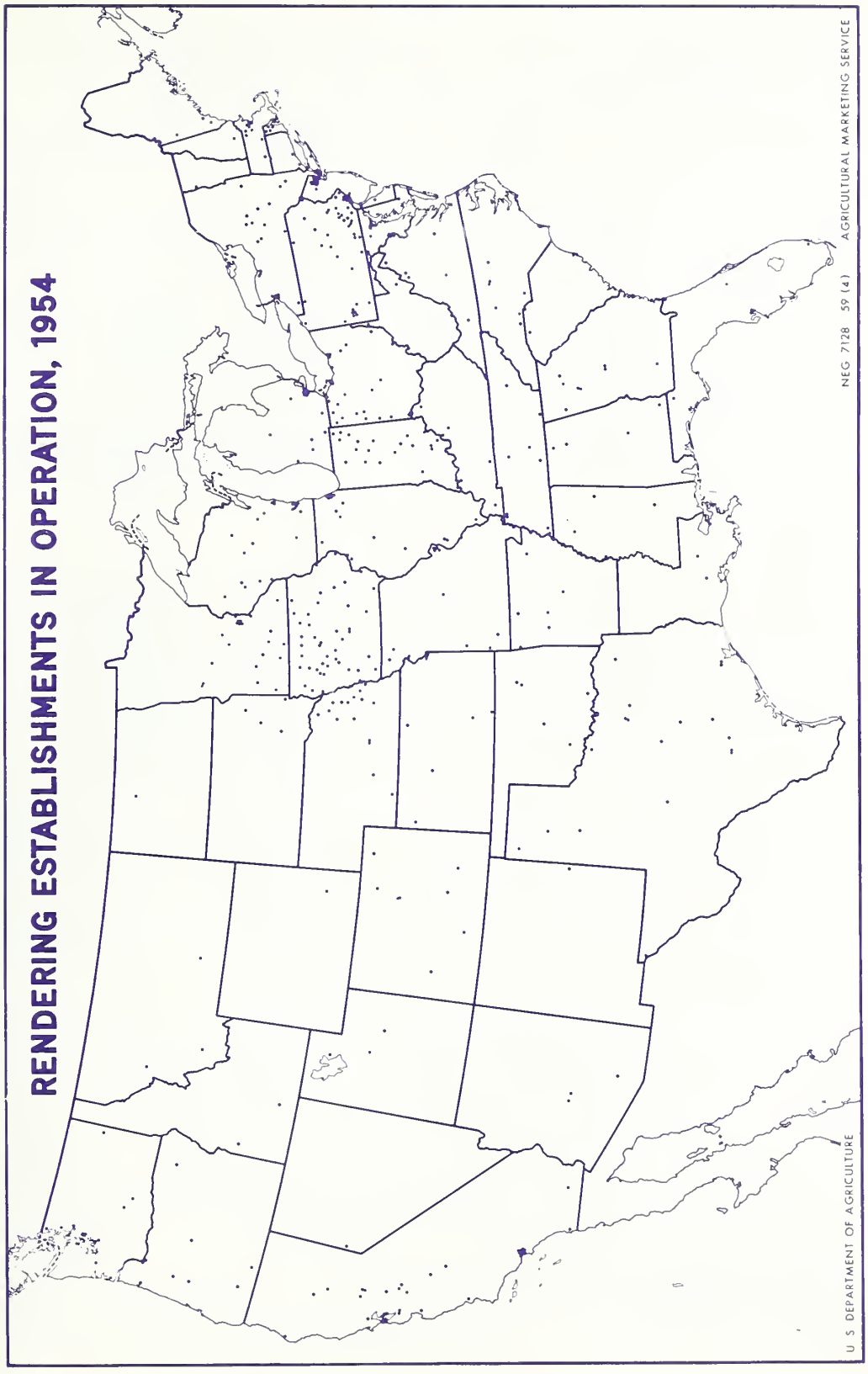
RENDERING ESTABLISHMENTS IN OPERATION, 1954
U S DEPARTMENT OF AGRICULTURE
NEG 7128 59 (4) AGRICULTURAL MARKETING SERVICE

Figure 4

Table 7.--Inedible tallow and grease shipped by rendering plants and increase in shipments per plant, by region and State, 1947 to 1954

Region and State	Plants		Shipments of inedible tallow and grease 1/		
	1947	1954	1947	1954	Percentage increase per plant
	Number	Number	1,000 pounds	1,000 pounds	Percent
United States	556	500	1,001,602	1,496,714	66
New England and Middle Atlantic	135	115	380,516	553,064	71
New York	34	32	139,854	193,828	47
New Jersey	19	16	60,639	85,626	68
Other	82	67	180,023	273,610	86
East and West North Central	251	202	402,878	490,780	51
Ohio	32	23	94,854	95,798	41
Illinois	35	18	107,072	104,758	90
Wisconsin	24	21	25,153	29,500	34
Minnesota	25	21	19,684	25,674	55
Iowa	48	44	29,771	38,230	40
Kansas	12	7	18,045	15,844	50
Other	75	68	108,299	180,976	84
South Atlantic and East South Central	54	71	52,808	130,480	88
West South Central	42	35	26,020	64,874	199
Mountain	21	22	24,601	34,136	33
Pacific	53	55	114,779	223,380	87
California	33	35	96,658	195,516	91
Other	20	20	18,121	27,864	54

1/ Data on shipments of inedible tallow and grease so closely approximate actual production that it may be assumed to be the same for purposes of comparison.

1947 and 1954 Censuses of Manufactures.

The increase in rendering plants in California and the Southeast seems to be following the changing pattern in livestock production and slaughter. While cattle slaughter increased 25 percent and hog slaughter 27 percent in the U. S. as a whole, cattle slaughter rose over 33 percent in the Southeast and 53 percent in California and hog slaughter rose 57 percent and 32 percent, respectively, in these areas.

There were 71 rendering plants located in rural counties in 1954. 14/ These rural plants produced only 4 percent of the total value of output of all rendering establishments (table 17). The 92 plants located in large metropolitan counties produced almost 49 percent of the total value of output of renderers. The proportion of rendering plants located in rural, rural-urban, urban, and metropolitan counties was not greatly changed in 1954 from that found in 1947. There does not seem to be any marked tendency of the industry to move from one type of area to another. The practice of locating rendering plants outside urban centers due to certain objectionable features of the rendering operation has been a factor in keeping a substantial part of the industry in rural and rural-urban areas.

Size of Plants

Average Employment

As used in this report, the classification of plants according to size is based upon average number of employees per establishment. U. S. average employment for rendering plants has varied little in the past 30 years. By 1921 employment averaged 20 persons per plant compared with 23 in 1954.

Rendering plants differ in size from single owner operated plants to plants employing 500 or more persons. In general it may be stated that the larger plants are located in the northeast and eastern part of the North Central States where there was an average of over 30 employees to a plant in 1954 (table 13). A large number of the smaller plants are located west of the Mississippi and south of the Ohio rivers; however, California has larger than average plants measured by employment.

In 1954, rendering plants employing 19 or fewer persons represented approximately 70 percent of the rendering industry, employed 27 percent of the employees and produced about 24 percent of the product (table 15). Only 9 percent employed more than 50 persons per plant, or 45 percent of the employees, and these plants produced close to 46 percent of the total product. 15/

14/ For use in this report counties have been classified as (1) rural, 500 or fewer manufacturing employees; (2) rural-urban, 501 to 10,000; (3) urban, 10,001 to 100,000; and (4) metropolitan, over 100,000.

15/ Proprietors and partners of unincorporated firms are excluded in reporting number of employees. In many establishments such persons perform the work of regular employees. This reporting practice influences estimated average shipments per employee and per man-hour.

The remainder, or those employing between 20 and 49 persons, averaged 28 percent of the total employees and 30 percent of the product. This segment of the industry accounted for a slightly larger share of the total value of shipments in 1954 than in 1947.

Changes Between 1947 and 1954

There was a reduction of 42 plants between 1947 and 1954 in the group employing between 5 and 9 persons but no reduction in the number of plants employing over 100 persons. U. S. average employment per plant might be expected to increase under these conditions but employment per plant increased only slightly in the four smallest plant sizes while it decreased in the two largest plant sizes, which resulted in practically no change in the U. S. average number of employees per plant. During the same period the average number of production employees was reduced in each size group while a slight increase in employment occurred in other categories of employment.

The decline of 42 plants in the two smaller plant size groups out of a total reduction of 56 plants for the entire industry indicates that as prices for rendered products fell and labor and other operating costs rose, many owners of small plants found their operations to be unprofitable. Many of the plants that continued to operate were able to overcome some of the pressure of rising wage rates by reducing their number of employees and reducing man-hours. In order to effect economies in labor, plants must be large enough to permit the specialization in labor necessary to the introduction of some mechanization or automation. According to trade reports, some mechanization has been introduced into average size plants as well as into the larger ones. Systems of more or less continuous processing have been adopted by some renderers. Delay in the continuous movement of products generally result from the delay for cooking, With raw materials usually available in lots and highly perishable, the practice of rendering in batches will be common practice for some time.

PRACTICES AND COSTS

Materials and Materials Costs

Materials costs as reported by the Bureau of the Census include payments made for raw materials, parts, containers, and supplies consumed in the production process. They represent a large part of total rendering costs.

During 1954, renderers paid 62 million dollars less for materials to produce 500 million more pounds of inedible tallow and grease than was produced in 1947. Prices for parts, containers, and supplies may be expected to rise with the general level of prices but raw material costs, which are the greater proportion of these costs, are related to the value of the tallow and grease and feed and fertilizer materials they yield.

Lower prices for tallow and grease in 1954 than in 1947 resulted in lower payments by renderers for raw material. Materials cost represented close to 60 percent of the value of all shipments in 1947, compared with 53 percent in 1954.

The U. S. average cost of materials and power per $1,000 shipment was lower for 1954 than for any other Census year except 1933 and 1935 (table 12). 16/ The proportionally lower costs of recent years have continued through 1957. 17/ Costs of materials in the North and South Central States generally average below those of the Northeast and Pacific States (table 14). Part of this may be due to differences in practices in rural and urban areas. Many of the rendering plants in the Central States are located in rural areas.

Urban and metropolitan areas generally have several rendering establishments that compete with each other for raw materials. This appears to result in the practice of pricing raw materials close to the value of the products obtained from each type of raw material (11, pp. 8-12). Urban renderers can usually pay more for raw material because the fat, bones, and trimmings collected yield proportionally more fat than the raw materials collected by rural renderers. Also, hauling distances are shorter.

Table 18 compares costs between counties classified by number of manufacturing employees within the county for 1947 and 1954. The larger plants, classified by number of employees, tend to pay more for materials than do smaller plants (table 16). These plants are usually located in urban areas.

Rendering plants that produce mostly tallow or grease or feed and fertilizer materials have above average materials costs.

Type of Raw Material Used

The type of material used by a rendering plant is largely determined by the location of the plant in relation to raw material supplies.

A random sample of 158 renderers out of 406 reporting to the Bureau of the Census in 1947 indicated the types of raw material used in the various sections of the U. S. 18/ Sixty-one percent of the sample reported using dead or fallen animals as raw material. Bones, raw fat, and butcher scraps were the next most commonly used types of raw material. Proportionally more rendering plants in the East and West North Central States reported the use of dead

16/ Raw materials, parts, containers, and supplies accounted for 97 percent of this cost in 1947 and 94 percent in 1954.

17/ The last full Census of Manufactures was taken in 1954.

18/ The total number of rendering plants reporting to the Bureau of the Census for 1947 was 556. The 406 plants from which this sample was selected were plants reporting 50 percent or more of the value of their shipments to be from inedible tallow and grease. See table 19.

animals than did rendering plants in the Middle Atlantic States, and relatively more plants used raw fat and bones in the Middle Atlantic States than in the North Central area. Data are not available which would indicate the volume or proportion of the different types of raw material used.

Slaughter Wastes

The bulk of the raw material used for rendering comes from livestock slaughtering operations. Some animals or parts of animals are termed inedible because of disease or injury.

Under the Federal Meat Inspection Law, which first went into effect June 30, 1906, all meat moving in interstate commerce is required to be Federally inspected. In plants using Federal Inspection every animal is required to be inspected in the pen on the same day that it is slaughtered and, if marked either condemned or suspect, it is kept apart from other animals. Condemned animals are slaughtered outside the slaughter plant and the entire animal is consigned to the inedible rendering department. Suspect animals are slaughtered apart from other animals and they, too, may go to the rendering department. A careful post mortem examination is also made of all carcasses and parts of carcasses to determine the wholesomeness of the meat.

The amount of raw material available from condemnations is important, but probably 95 percent or more of the raw material accumulated at slaughtering plants is inedible offal from healthy animals which is termed, by definition, unfit for human consumption. 19/

Many meat packers turn this raw material over to a renderer. Slaughterers may charge $1 or more per head for the fat, bones, and offal which they sell to renderers (11, pp. 10-11).

Production of tallow and grease has increased with increased livestock production and slaughter. Gains in production, however, have been proportionally greater than the increase in live weight of slaughter. The data indicate the greater rise in tallow production per unit of live weight compared with the increase grease production. By 1955 the percentage yield of tallow was about 3.7 percent above the 1935 average (table 22).

More recently poultry wastes from commercial poultry slaughtering plants have been added to the raw material supplies of the rendering plant. It has

---

19/ Most of the large meat packers and many of the smaller ones render their inedible waste in order to increase their profit margin by obtaining the full value from the animals which they handle. It is estimated that meat packers who rendered their own inedible byproducts averaged about $1.78 per head of cattle from sale of inedible tallow and grease in 1954 and $4.54 in 1947. The estimated average value per head for feed and fertilizer byproducts was very close to the value for tallow and grease in 1954 but the value of fats was substantially greater in 1947 because of relatively higher market prices for fats.

been estimated that commercial poultry comprises about 76 percent of the U. S. total volume of poultry slaughtered. Poultry slaughter wastes are equal to between 20 and 30 percent of the weight of poultry killed and totaled around 1.4 billion pounds in 1955 (7, p. 1). When rendered, these wastes yield comparatively small amounts of fat in proportion to the output of feed byproducts.

Fat, Bones, and Trimmings

Some renderers, especially those in urban areas, obtain a large part of their raw material for rendering from meat and poultry retail outlets, public eating places, and institutions. The large quantities of waste fats and animal products accumulated by restaurants, hotels, public institutions, grocery stores and butcher shops are usually convenient for the renderer to collect.

Present day marketing practices of grocery stores and meat markets have tended to increase supplies of this material, since much of the trimming of meat is done at the retail store.

Renderers reduce their raw material costs, particularly when tallow and grease prices are low, by being more discriminatory in the service they will perform in the collection of raw materials and in the price they will pay for these wastes. Different raw materials not only yield different amounts of rendered products but also products of different quality. The advantage to the supplier of the raw material of having the wastes removed from the premises is also a factor that receives added consideration when byproduct prices are low.

Fallen Animals

It is estimated that close to 20 million animals die on farms each year. Not all of these animals reach rendering plants. Many farms and ranches are located far from a renderer. When the cost of hauling is excessive in relation to the value of rendered products, the renderer will not travel as far from his plant to pick up fallen animals, and instead of paying the owner of the animal, he may charge him instead for the service of hauling the animals away.

Household Garbage and Sewerage

The rendering of garbage and sewage sludge to obtain inedible grease probably is a thing of the past. During the period 1945-49, six cities in the U. S. employed the reduction process for disposal of garbage either in whole or in part. These cities were Philadelphia and Reading, Pa.; Washington, D. C., Indianapolis, Ind; and Rochester and Syracuse, N. Y. By 1954 only one plant was still in operation.

While the rendering of garbage and sewage for inedible grease, feed, and fertilizer is uneconomic under present conditions, it is a potential source of those products, should prices increase and other conditions become favorable to their production.

Labor and Labor Costs

Average Labor Costs

Labor costs are second in importance only to material costs. In 1947 these costs averaged about 13 percent of the total value of shipments compared with 21 percent for 1954. The proportion labor costs represented of the value of shipments in 1947 was lower than in any other census except 1899, the first Census of Manufactures taken. A more rapid rise in tallow and grease prices than in wage rates influenced this relationship. By 1949 labor costs approached 20 percent of the value of shipments. Prices for fats had adjusted downward and wages had increased by that time. Labor costs represented a larger proportion of the value of shipments in the East South Central States than in other areas in both 1947 and 1954.

Labor and Wages

In 1947 production workers averaged about 81 percent of the labor force and received 74 percent of the total payroll. (See table 11.) The 1954 Census of Manufactures and the annual Survey of Manufactures show a decrease in the relative number of production employees and the percentage of the payroll going for production workers' wages. 20/ At the same time that employment of production workers decreased, employment of other personnel increased slightly and salaries also increased. Somewhat wider use of machinery, more efficient use of production labor and use of additional services such as selling, research, or other services affected the number and type of employee. Average wages per man-hour for production workers rose from $1.22 per hour in 1947 to $1.60 in 1954. 21/ The somewhat greater percentage increase in hourly wages as compared with the increase in average annual salaries points to the fact that a decrease in average man-hours per production employee took place between these years. This decrease averaged 38 man-hours per production employee and this reduction, together with the reduction in number of production employees, resulted in an overall decrease of 4 million production man-hours between 1947 and 1954.

Output per Production Man-hour

In spite of reductions in man-hours, the industry produced about 50 percent more inedible tallow and grease in 1954 than in 1947. Production of feed and fertilizer materials also increased, and the average output of the rendering industry per production man-hour rose 80 percent above the 1947 level (table 8). 22/

20/ See appendix for definition of "production workers" and "other employees"

21/ Average wages per man-hour for production workers rose to $1.81 in 1957.

22/ This represents a very large increase in output compared with those reported by the Federal Reserve Board for groups of products. More variation would be evident for individual products than for groups of products.

Table 8.--Output of rendered byproducts per production man-hour for rendering establishments and percentage increase in output, 1947 to 1954 1/

Region and State	Average output per man-hour				Percentage increase in output 1954 over 1947	
	1947		1954			
	Tallow and grease	Total primary products 2/	Tallow and grease	Total primary products 2/	Tallow and grease	Total primary products 2/
	Pounds	Pounds	Pounds	Pounds	Percent	Percent
United States	42.4	68.6	76.5	123.6	84.4	80.2
New England and Middle Atlantic	51.8	79.9	97.9	143.9	89.0	80.1
New York	49.2	79.1	84.5	129.1	71.7	63.2
New Jersey	44.0	72.3	86.5	124.6	96.6	72.3
Other	57.5	84.0	115.7	166.3	101.2	98.0
East and West North Central	38.2	66.7	66.6	120.9	74.3	81.3
Ohio	45.4	75.9	89.2	157.1	96.5	107.0
Illinois	39.0	82.2	75.2	165.1	92.8	100.7
Minnesota	28.7	45.6	43.2	72.6	50.5	59.2
Iowa	32.6	57.7	36.4	79.8	11.6	38.3
Other	36.7	57.2	69.6	112.1	89.6	96.0
South Atlantic and East South Central	29.9	41.3	47.3	83.7	58.2	102.7
West South Central	20.6	43.4	50.4	83.4	144.7	92.2
Mountain	47.8	83.7	73.7	121.7	54.2	45.4
Pacific	53.3	73.2	109.3	157.1	105.1	114.6
California	57.7	78.0	116.6	164.9	102.1	111.4
Other	37.8	56.3	76.5	121.3	101.3	115.5

1/ The estimated output per man-hour is based on shipment data because it is representative of actual production and because of the advantage of being able to check volume of shipments against value for more accuracy.

2/ Primary products include tallow and grease and feed and fertilizer materials. Total output per man-hour is shown in terms of inedible tallow and grease for purposes of comparison. The unit value for tallow and grease used to compute 1954 output was adjusted for the difference in trend in feed and fertilizer prices compared with tallow and grease prices between 1947 and 1954.

Estimated from the 1947 and 1954 Censuses of Manufactures, U. S. Bureau of the Census.

The increased output per man-hour may have resulted in part from the reduction in the number of small plants in operation which usually report lower average outputs per man-hour.

Although the average output per man-hour increased 80 percent in volume, the value of output was reduced by about 12 percent. Decreased prices for products, and increased average hourly wages for production workers are the factors that have tended to increase the relative labor cost for 1954 above the 1947 level. The increased output was able to offset only a part of the increased differences between wages and prices.

Wage Rates and Output

Despite the growing disparity between average wages and value of output per production man-hour between 1947 and 1954, average data show a close relationship between wages and output for any one year (fig. 5). Higher hourly wages are accompanied by higher average output per man-hour. Even though the association between these two variables is close, there is a great deal of variation among individual plants. This is due to difference in operating practices, equipment, quality of raw material and products, and availability of markets. Many plants that are very small operate with a minimum of equipment, with unskilled labor, and produce semifinished or low quality products. Selling tankage as it comes from the cooker is one means of reducing labor requirements. Larger plants can often use many more quality controls and less man-hours with better plant layout and equipment.

Fuel and Electricity

Renderers used close to 7 million dollars worth of fuel and electricity to process inedible animal wastes into tallow and grease and feed and fertilizer materials in 1954. This represents an increase of $\frac{3}{4}$ million dollars over the 1947 cost.

Fuel is consumed in rendering establishments mainly for producing steam for cooking the raw materials and for evaporating the moisture still remaining in the products. About 8 hours are required to cook a batch of raw material and the moisture contained in feed and fertilizer byproducts as they come from the cooker is further reduced by 10 to 12 percent (1, pp. 151 and 378).

The amount of fuel used is related to the amount of water that is evaporated during the rendering process and to the efficiency of cookers, dryers, and boilers. 23/ The use of coal as a fuel decreased by 150 thousand tons between 1947 and 1954 due in part to the increased use of fuel oil and gas. In 1954, fuel costs averaged 10,122 dollars per plant, compared with 7,746 dollars in 1947.

23/ The minimum requirement for every pound of water evaporated is 1,200 B.t.u., and of this 100 B.t.u. are required to warm up the materials. The estimated actual requirement is 1,765 B.t.u. (8, pp. 72-4).

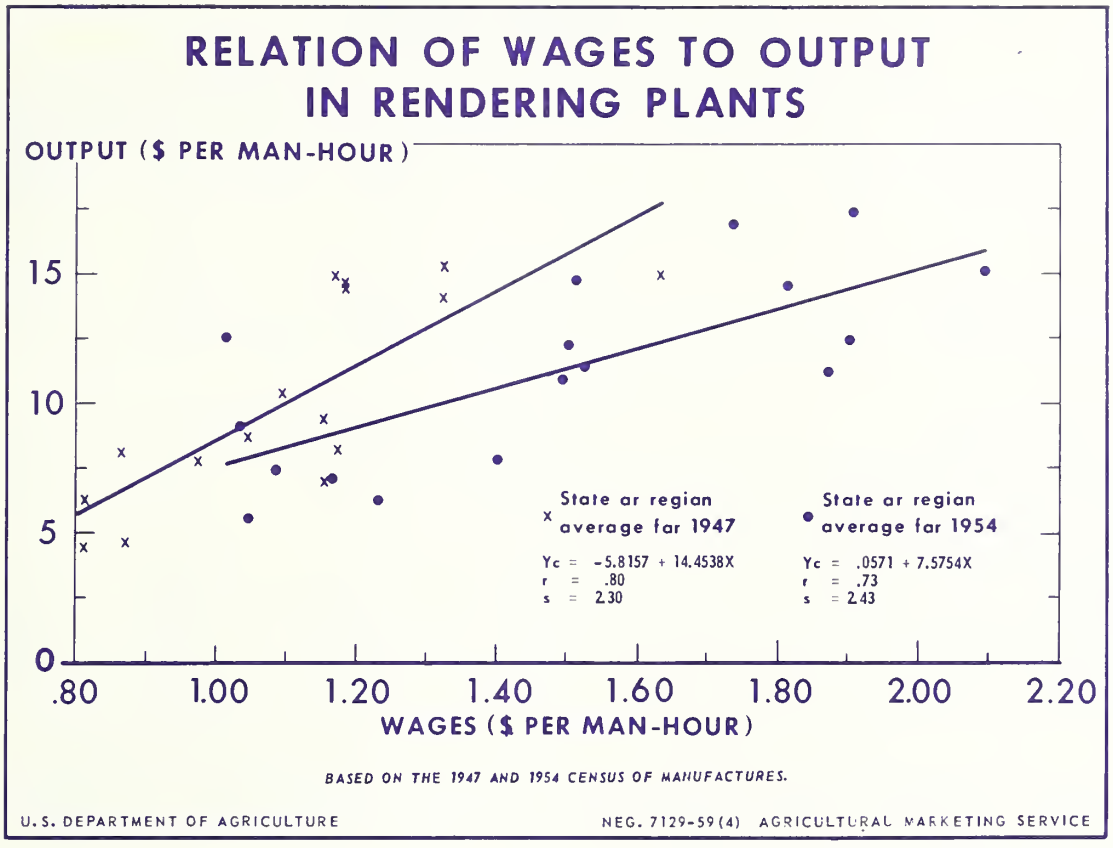

Figure 5

Electric power is required for the various motors used in the rendering process. The uses include motors for (1) moving the raw materials and products, (2) cracking large bones prior to cooking to speed the process, and (3) grinding dry meat scraps and tankage. 24/ Rendering plants also increased the use of electricity between 1947 and 1954. The average consumption of electricity for 1954 was 24,000 kw.-hr. and cost approximately $3,500 per plant.

The reported increase in the amount of fuel and electricity use has not been as great proportionally as the increase in the output of rendering establishments. As a result, estimated average costs per ton of product have been reduced between 1947 and 1954 (table 9). In 1954, they averaged $3.45 per ton compared with $4 in 1947. Some differences in these costs are shown by areas.

Average costs of fuel and electricity are influenced by shipping and handling costs and local taxes, as well as by the efficiency with which they are used.

24/ Power consumption has been estimated from actual rendering costs to be about 10 kw.-hr. per million B.t.u.'s of fuel consumed (8, p. 74).

Table 9.--Fuel and electricity: Estimated average costs to the rendering industry, 1947 and 1954

Year and region	Cost per ton of product 1/			
	Fuel	Electricity 2/	Total	Deviation from U. S. average
	Dollars	Dollars	Dollars	Dollars
1947:				
United States	2.85	1.15	4.00	---
1954:				
United States	2.45	1.00	3.45	---
New England and Middle Atlantic	3.05	.85	3.90	+0.45
East and West North Central	2.25	.95	3.20	-.25
South Atlantic and East South Central	1.95	1.20	3.15	-.30
West South Central	1.55	1.40	2.95	-.50
Mountain	2.50	1.15	3.65	+.20
Pacific	2.35	1.05	3.40	-.05

1/ In this table, costs for fuel and electricity have been estimated per ton of product, including tallow and grease, and feed and fertilizer. Where data were not available, quantities produced have been estimated from value of shipments and approximate value per ton.

2/ Costs for electricity allow for average value of electricity generated by renderers in their own plants.

Estimates based on the 1947 and 1954 Censuses of Manufactures, U. S. Bureau of the Census.

Expenditures for New Plants and Equipment

In 1954, renderers spent about 8 million dollars for new plants and equipment, 35 percent less than in 1947. About 80 percent of the total expenditure was made by establishments in the Northeast and North Central States. The Northeast was the only area to increase the 1954 investment in the rendering industry over the 1947 level. States in the North Central area reduced expenditures between the two years by over 50 percent.

The decrease in expenditures in 1954 from the 1947 level averaged about $6,400 per plant. The difference in the general level of prices between these two years makes this decrease even more significant.

Summary of Changes in Costs

The cost of materials, labor, and power required to produce a ton of inedible rendered byproducts was reduced between 1947 and 1954 by about $66 per ton of product (table 10). Most of the reduction occurred in the cost of raw materials. The estimated reduction in the cost of all materials averaged about $62 per ton. 25/

Table 10.--Materials, parts, containers and supplies, fuel, electricity, contract work, and labor per ton of output: Average costs to the rendering industry, 1947, 1954, and 1957 1/

Item	Average costs per ton of tallow and grease			Average cost per ton of tallow and grease and feed and fertilizer materials		
	1947	1954	1957	1947	1954	1957
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Materials, parts, containers and supplies	224.64	72.31	2/81.00	120.35	58.04	2/56.70
Fuel	5.30	3.05	---	2.85	2.45	---
Electricity	2.15	1.20	---	1.15	1.00	---
Contract work	.08	.47	---	.04	.37	---
Labor	48.15	28.22	31.30	25.80	22.65	21.90
Total costs	280.32	105.25	112.30	150.19	84.51	78.60
Value of products	376.35	134.70	148.00	201.63	108.06	103.70
	Percent	Percent	Percent	Percent	Percent	Percent
Costs as percentage of value of products	74	78	76	74	78	76

1/ Estimates based on reported costs prorated between primary products on the basis of value.
2/ Includes fuel, electricity, and contract work.

Based on (1) the 1947 and 1954 Censuses of Manufactures, and (2) the 1957 Annual Survey of Manufactures, U. S. Bureau of the Census.

Average wages of production labor increased about 31 percent between 1947 and 1954. This rise was more than offset by increased output per production man-hour. The estimated increase in output averaged 80 percent for the U. S.

25/ Cost of materials covers the total delivered cost of all raw materials, semifinished goods, parts, components, containers, scrap, and supplies consumed.

Fuel and electricity costs averaged $3.45 per ton of product in 1954 compared with $4 in 1947. Between 1947 and 1954 the cost of materials, labor, and power declined 55 percent.

In spite of major reductions in costs, there was an increase in the ratio of these costs to the market value of the rendered byproducts produced. In 1954, these costs averaged about 78 percent of the value of products shipped compared with 74 percent in 1947 and 76 percent in 1957.

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APPENDIX

EVALUATION OF MAJOR ECONOMIC FACTORS RELATED TO TALLOW AND GREASE PRODUCTION

Analysis of the relationship between several major economic factors and the production of inedible tallow and grease show the effect of important changes that have occurred in recent years. Simple correlations have been computed between the following variables: (1) Tallow and grease prices, (2) live weight of slaughter, (3) the time factor, (4) the soap market for tallow and grease, (5) the export market, and (6) lard prices. Most of these factors have already been discussed in some detail and their relationship to the tallow and grease industry has been pointed out. The relationship between the production of tallow and grease and each of these factors is shown separately in figure 6.

Tallow and Grease Prices

Prices for tallow and grease seem to be inversely related to production during a large part of the period 1935-56, but they do not show the same association between 1941 and 1948. During this period prices were influenced by numerous Government wartime programs. Programs to increase agricultural production and lend lease were begun in 1941. Ceiling prices and allocation of supplies followed soon after. At the close of the war, domestic supplies were very short and commitments to foreign governments were large. Omission of these 8 years from the analysis gives an r^2 of 0.75, which indicates that price and production were inversely related during 1935-40 and 1949-56 when major outside influences did not disturb the relationship.

Live Weight 26/

The inedible tallow and grease industry is dependent upon livestock production and the activity of the livestock slaughtering industry for its raw materials. Since this is true, it is reasonable to expect the close association between the live weight of slaughter and the production of tallow and grease shown.

With low prices for fats, some of the wastes may be disposed of in other ways but generally they will be rendered.

Factors affecting meat production will necessarily affect tallow and grease production by increasing or decreasing available supplies of raw material.

26/ Live weight of slaughter as used here is the total live weight of commercial slaughter of cattle, calves, hogs, and sheep and lambs. There is an even closer relationship between the production of beef and pork and the production of tallow and grease.

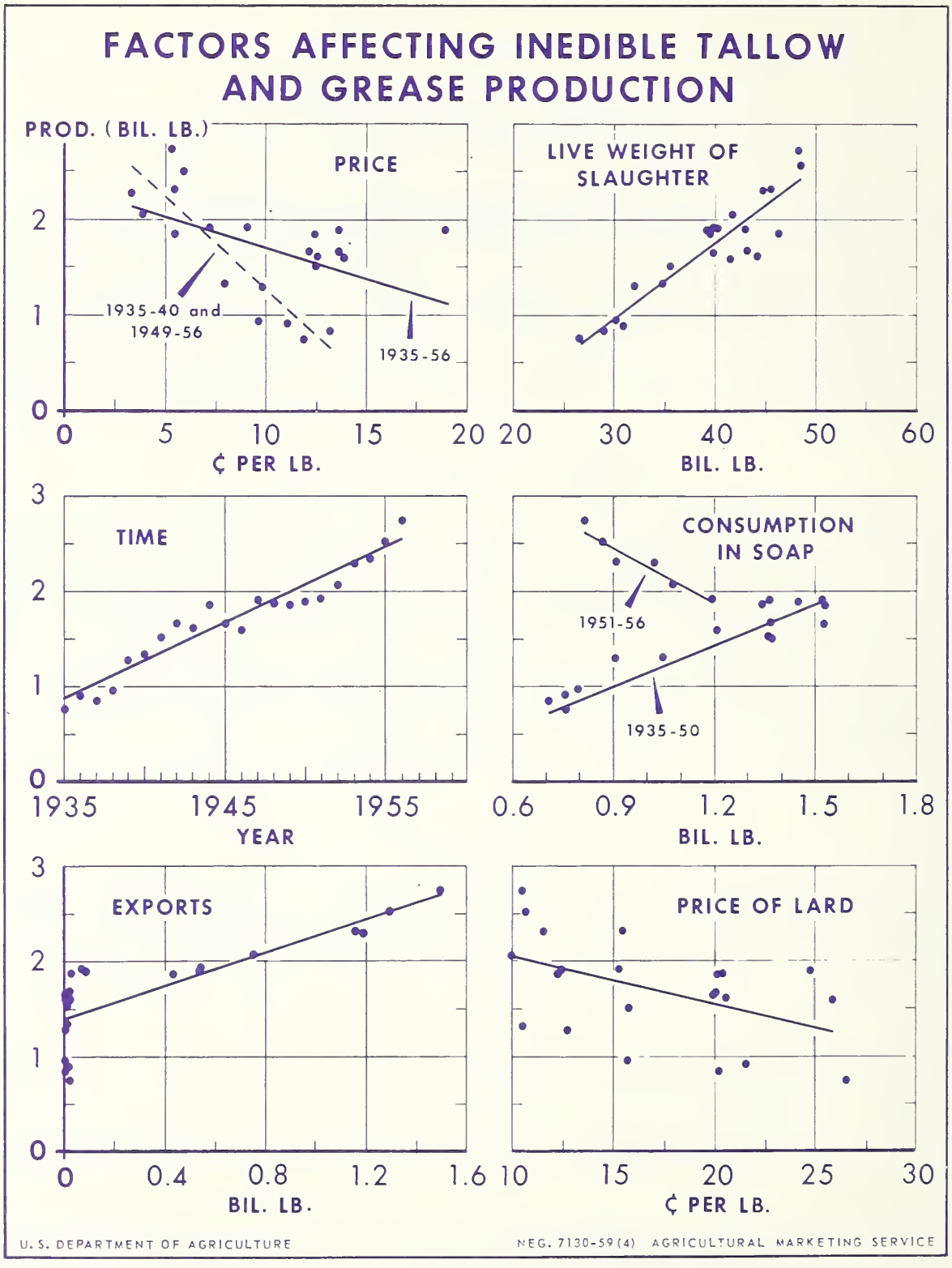
FACTORS AFFECTING INEDIBLE TALLOW AND GREASE PRODUCTION
PROD. (BIL. LB.)
PRICE
1935-40 and 1949-56
1935-56
¢ PER LB.
LIVE WEIGHT OF SLAUGHTER
BIL. LB.
TIME
YEAR
CONSUMPTION IN SOAP
1951-56
1935-50
BIL. LB.
EXPORTS
BIL. LB.
PRICE OF LARD
¢ PER LB.
U.S. DEPARTMENT OF AGRICULTURE
NEG. 7130-59(4) AGRICULTURAL MARKETING SERVICE

Figure 6

Trend

Both tallow and grease production and livestock slaughter have moved upward from year to year. The growth of the U. S. economy over the past 20 or more years due to gains in population and scientific and industrial development is a common factor of major significance in determining the growth of the rendering and meat industries.

Inedible tallow and grease production increased, on an average, about 150 million pounds per year over the past 10 years. The growth in production has not been a straight line growth. The two periods during which a leveling off in production occurred were (1) the economic depression of the 1930's and (2) the late World War II and the postwar period. The cycles that occur in cattle production also tend to cause periodic leveling off in tallow and grease production. The two periods during which the sharpest advances in production were made were between 1937 and 1944 and since 1950.

Consumption in Soap

The close association between the production of these fats and their use in soap from 1935 to 1950 is shown by the lower line in figure 6. Beginning with 1951, this use decreased despite rapidly increasing supplies. There is no reason to expect any change in the present trend in this use of inedible tallow and grease.

Exports

Exports of inedible tallow and grease show a close relationship to production beginning with 1949. Very little inedible animal fat was exported prior to that date, but since 1949 exports have increased rapidly.

Lard Prices

Lard prices show a similar relationship to the production of inedible fats that inedible fats prices do. They are both dependent upon the livestock industry for raw material and they both compete somewhat for the animal fat market and for raw material.

DEFINITIONS OF CENSUS TERMS
(12, pp. 3-8)

There are several terms used for Census reporting that will be used in this discussion which require clarification. Perhaps the most important of these is the definition of an "industry."

1. Industry: An industry is generally defined as a group of establishments with a single product or a closely related group of products. Such products are called primary products. An establishment is classified in a particular industry if its production of the industry's primary products exceeds in value the production of products of any other single industry. In the case of rendering, the combined value of the primary products--inedible tallow and grease and feed and fertilizer materials--must exceed the value of the products of any other industry classification. The classification of an establishment may be different under one Census than under another if the establishment produces primary products of two industries and if the value of the primary products of another industry exceed the value of the primary products of the industry in which the establishment was originally classified, or if there is a change in the nature of some of its products. For example, if the operations of a rendering establishment should so change that its sales of mixed feeds or mixed fertilizer or some other allied product should exceed the value of the primary products of the rendering industry, the establishment would no longer fall under the rendering industry classification.

Census reports are made on an establishment basis rather than on a company basis in order to fully cover the factors related to a single "industry." All establishments employing one or more persons were required to report in 1947 and 1954.

2. Employees: Data on employees used in this report fall into two categories: (1) Production and related workers, and (2) all employees. Production and related workers (up through the foreman level) are the workers engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering) maintenance, repairing, janitorial and watchman type work, product development, and auxiliary production for plant's own use (for example, power plant), record keeping, and other work closely associated with these production operations. The classification of all employees includes supervisory above a working foreman, sales (including driver salesmen), sales delivery (truck drivers and helpers), advertising, credit, and collection, as well as production and related workers. Proprietors and partners of unincorporated firms and employees at central administrative or auxiliary units of multiestablishment firms are excluded.

3. Number of Employees: The term "number of employees" is a simple average of the employment of the midmonth pay period. Twelve months of employment were reported for 1947 and 4 months (March, May, August, and November) for 1954.

4. Wages and Salaries: Production employees' wages include all forms of compensation to production and related workers prior to deductions for social security or other withholding as used for calculating the Federal withholding tax. It does not include employers' contribution to Social Security. "All payrolls" includes wages for production and related workers and salaries of all other employees, including officers of the establishment but excluding payments to proprietors or partners of unincorporated firms and employees at Central Administrative or auxiliary units of multiestablishment firms.

5. Production Man-hours: "Production man-hours" represents all hours worked, including overtime but does not include paid vacations, holidays, or sick leave.

6. Cost of Materials: The term "cost of materials" includes (a) the total delivered cost of all raw materials, semifinished goods, parts, components, containers, scrap, and supplies consumed or put into production, (b) the amount paid for electric energy purchased, (c) the amount paid for fuels consumed for heat, power, or the generation of electricity, and (d) the cost of work done by others on materials or parts furnished by manufacturing establishments (contract work). It covers goods purchased, withdrawn from inventory, and received from another establishment in the same company. Cost refers to direct charges actually paid or payable, after discounts, including freight and other direct charges incurred. On the other hand, it does not include the cost of products bought and resold in the same condition and the cost of services used such as advertising, insurance, and telephone. Also excluded are overhead costs and cost of material and equipment for plant expansion.

7. Value of Shipments: "Value of shipments" as used here is the received or receivable net selling value f.o.b. plant after discounts and allowances, and excluding freight charges and excise taxes. Interplant transfers are included with shipments.

8. Value Added: The term "value added" is used to designate the margin between the value of shipments as defined above and the costs of materials or the value added to the materials used in the manufacturing process.

Table 11.--Rendering industry: Selected general statistics, 1931-57 1/

Year	Establishments	All employees		Production and related workers		Cost of materials 2/	Value of shipments 3/
		Number	Salaries and wages	Number	Salaries and wages		
	Number		1,000 dollars		1,000 dollars	1,000 dollars	1,000 dollars
1931	238	---	---	4,067	5,225	17,533	29,241
1933	201	4,682	5,255	3,988	4,099	14,141	26,238
1935	259	5,713	7,701	4,761	5,390	22,214	39,836
1937	266	6,078	9,022	5,200	6,763	32,980	52,269
1939	310	6,536	9,596	5,201	6,509	38,115	58,226
1947 4/	554	12,364	38,588	9,967	28,419	186,751	303,291
1949	---	11,656	37,506	8,847	26,373	120,089	193,864
1950	---	12,331	40,592	9,673	29,220	143,242	231,378
1951	---	11,452	41,453	9,069	30,038	170,644	274,651
1952	---	10,636	41,413	8,459	30,091	107,337	181,377
1953	---	11,597	45,894	9,033	33,979	124,400	212,964
1954	500	11,466	46,633	8,480	31,291	127,072	222,516
1955	---	11,642	48,462	8,644	32,605	136,841	233,550
1956	---	12,193	52,760	8,991	35,620	142,886	254,917
1957	---	12,000	56,000	9,000	38,000	145,000	265,000

1/ An industry is defined as a group of establishments with a single product or a more or less closely related group of products. The rendering industry is comprised of establishments primarily engaged in producing inedible tallow and grease from animal fat, bones, and meat scraps.

2/ Materials, parts, containers, supplies, fuel, electricity, and the cost of contract work.

3/ Including interplant transfers.

4/ Revised data.

Based on (1) Censuses of Manufactures, 1931-47 and 1954; (2) Annual Survey of Manufactures, U. S. Bur. of the Census, 1949-53 and 1955-57.

Table 12.--Cost per shipment or interplant transfer at rendering establishments of products valued at $1,000, 1931-57

Year	Cost per $1,000 shipment 1/			
	Payroll	Materials 2/	Other costs and profit	Total
	Dollars	Dollars	Dollars	Dollars
1931	---	600	---	1,000
1933	200	539	261	1,000
1935	193	558	249	1,000
1937	173	631	196	1,000
1939	165	655	180	1,000
1947 3/	128	616	256	1,000
1949	193	619	188	1,000
1950	175	619	206	1,000
1951	151	621	228	1,000
1952	228	592	180	1,000
1953	215	584	201	1,000
1954	210	571	219	1,000
1955	208	586	206	1,000
1956	207	561	232	1,000
1957	211	547	242	1,000

1/ Including interplant transfers.
2/ Includes cost of materials, parts, containers, supplies, fuel, electricity, and cost of contract work.
3/ Revised 1947 data.

Based on (1) the Census of Manufactures, 1931-47 and 1954, and (2) Annual Survey of Manufactures, U. S. Bur. of the Census, 1949-53 and 1955-57.

Table 13.--Selected statistics for rendering establishments, by region and State, 1947 and 1954

Region and State	Establishments	Average per plant								
		All employees		Production employees			Cost of materials, etc. 1/	Value of shipments 2/	Capital expenditures 3/
		Number	Payroll	Number	Man-hours	Wages			
	Number		1,000 dollars		1,000 hours	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
1947:									
United States	556	22.4	70.1	18.1	42.5	51.7	337.3	547.7	22.7
New England and Middle Atlantic	135	28.4	93.6	23.3	54.4	69.3	486.0	839.5	22.3
New York	34	42.3	149.7	34.6	83.6	109.9	595.8	1,274.8	25.3
New Jersey	19	36.8	127.9	30.9	72.5	95.6	673.6	1,016.7	36.2
Other	82	20.7	62.4	16.9	38.2	46.3	396.9	617.9	17.8
East and West North Central	251	23.1	70.7	17.8	42.0	50.0	332.3	516.0	25.3
Ohio	32	37.8	114.9	29.2	65.2	77.0	633.9	949.9	48.2
Illinois	35	46.8	133.7	33.6	78.4	91 9	833.8	1,166.6	29.7
Minnesota	25	13.7	43.8	11.0	27.4	32.0	115.2	224.8	25.6
Iowa	48	9.9	29.4	7.4	19.0	20.8	83.1	196.8	8.0
Kansas	12	27.8	98.8	23.9	62.7	72.0	216.3	438.6	35.4
Other	99	18.1	57.5	14.6	34.1	42.5	247.1	383.4	23.5
South Atlantic	37	20.3	55.8	17.0	41.5	38.5	219.2	358.8	17.4
East South Central	17	7.6	15.7	6.4	13.6	11.9	32.7	63.0	8.3
West South Central	42	13.8	36.1	12.0	30.1	29.2	140.1	234.1	12.8
Mountain	21	13.9	41.0	10.4	24.5	29.3	239.6	359.2	37.4
Pacific	53	20.6	73.2	18.5	40.7	63.3	357.3	565.4	23.1
California	33	26.0	95.7	23.4	50.8	82.6	472.1	756.9	26.6
Other	20	11.7	36.2	10.3	24.0	31.4	168.0	250.0	17.4
1954:									
United States	500	22.9	93.3	17.0	39.1	62.6	254.1	445.0	16.3
New England and Middle Atlantic	115	30.4	138.9	22.3	49.1	88.4	395.2	640.2	33.4
New York	32	40.5	184.8	32.0	71.7	136.4	561.1	893.3	21.9
New Jersey	16	42.1	184.9	28.9	61.9	115.8	461.1	688.8	8.9
Other	67	22.8	106.0	16.1	13.3	58.9	300.2	507.8	44.7
East and West North Central	202	21.7	86.9	15.7	36.5	58.8	229.1	414.3	13.6
Ohio	23	30.9	132.2	20.7	46.7	84.4	411.1	677.4	4/
Illinois	18	46.7	197.2	32.7	77.4	133.8	815.9	1,305.0	19.8
Minnesota	21	14.3	50.4	10.7	28.3	34.7	61.1	176.7	9.2
Iowa	44	14.1	50.1	10.1	23.9	33.5	80.2	188.5	7.9
Kansas	77	20.1	75.1	12.7	27.9	42.4	184.0	316.7	14.3
Other	89	8.6	80.6	15.0	34.4	56.4	180.1	341.7	4/
South Atlantic	48	24.0	83.0	18.1	45.4	51.0	187.8	377.1	4/
East South Central	23	12.9	37.0	10.0	25.3	26.2	63.0	139.6	4/
West South Central	35	18.1	57.1	14.6	36.7	39.6	152.9	274.7	9.0
Mountain	22	12.1	46.9	8.8	21.0	31.3	109.7	227.2	7.9
Pacific	55	22.5	113.5	17.1	37.1	75.1	311.3	532.1	17.3
California	35	29.8	153.5	22.3	47.9	100.3	423.4	721.6	23.1
Other	20	9.7	43.4	8.1	18.3	31.0	115.2	200.5	7.0

1/ Materials, parts, containers, supplies, fuel, electricity, and cost of contract work.
2/ Including interplant transfers.
3/ Expenditures for permanent additions and major alterations to plants as well as new equipment and machinery chargeable to fixed assets accounts and of a type for which depreciation accounts are ordinarily maintained.
4/ Not reported to avoid disclosure of the operations of individual companies.

Based on the 1947 and 1954 Censuses of Manufactures.

Table 14.--Costs per shipment or interplant transfer of products valued at $1,000 and output and costs per production man-hour, of rendering establishments, by region and State, 1947 and 1954

Region and State	Cost per $1,000 shipment				Output and costs per production man-hour			
	Payroll	Materials 1/	Other costs and profits	Total	Value of output 2/	Cost of material 1/	Value added 3/	Average hourly wage
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1947:								
United States	128	616	256	1,000	12.90	7.94	5.03	1.22
New England and Middle Atlantic	111	579	310	1,000	15.42	8.92	6.50	1.27
New York	117	467	416	1,000	15.26	7.13	8.07	1.32
New Jersey	126	663	211	1,000	14.02	9.29	4.85	1.32
Other	101	642	257	1,000	16.18	10.40	5.80	1.21
East and West North Central	137	644	219	1,000	12.27	7.90	4.55	1.19
Ohio	121	667	212	1,000	14.57	9.72	4.61	1.18
Illinois	115	715	170	1,000	14.89	10.64	5.24	1.17
Minnesota	195	513	292	1,000	8.20	4.20	4.00	1.17
Iowa	150	422	428	1,000	10.33	4.36	5.97	1.09
Kansas	225	493	282	1,000	7.00	3.45	3.15	1.15
Other	150	645	205	1,000	11.25	7.25	3.99	1.25
South Atlantic	156	611	233	1,000	8.65	5.30	3.35	.93
East South Central	249	519	232	1,000	4.62	2.40	2.22	.87
West South Central	154	600	246	1,000	7.77	4.65	3.22	.97
Mountain	114	667	219	1,000	14.65	9.78	4.48	1.18
Pacific	130	632	238	1,000	13.91	8.80	5.11	1.56
California	124	624	252	1,000	14.90	9.31	5.60	1.63
Other	145	673	182	1,000	10.42	7.01	3.41	1.31
1954:								
United States	210	571	219	1,000	11.37	6.49	4.88	1.60
New England and Middle Atlantic	217	617	166	1,000	13.03	8.04	4.99	1.80
New York	207	628	165	1,000	12.46	7.83	4.63	1.90
New Jersey	268	669	63	1,000	11.13	7.45	3.68	1.87
Other	209	591	200	1,000	14.39	8.51	5.88	1.67
East and West North Central	210	553	237	1,000	11.36	6.28	5.08	1.61
Ohio	195	607	198	1,000	14.51	8.81	5.70	1.81
Illinois	151	625	224	1,000	16.86	10.54	6.32	1.73
Minnesota	285	346	369	1,000	6.25	2.17	4.08	1.23
Iowa	266	425	309	1,000	7.89	3.35	4.54	1.40
Kansas	237	581	182	1,000	11.37	6.61	4.76	1.52
Other	236	527	237	1,000	9.94	5.24	4.70	1.64
South Atlantic	220	498	282	1,000	8.31	4.14	4.17	1.12
East South Central	265	452	283	1,000	5.53	2.50	3.03	1.04
West South Central	208	557	235	1,000	7.48	4.17	3.31	1.08
Mountain	206	483	311	1,000	10.80	5.22	5.58	1.49
Pacific	213	585	202	1,000	14.33	8.39	5.94	2.02
California	213	587	200	1,000	15.06	8.84	6.22	2.09
Other	217	574	209	1,000	10.95	6.29	4.66	1.70

1/ Includes materials, parts, containers, supplies, fuel, electricity, and the cost of contract work.
2/ Value of shipments and interplant transfers used to estimate output per production man-hour.
3/ Difference between value of output and cost of materials.

Based on the 1947 and 1954 Censuses of Manufactures.

Table 15.--Selected statistics for rendering establishments, classified by size, 1947 and 1954

Size of plant, by number of employees	Establishments	Average per plant						
		All employees		Production employees			Cost of materials 1/	Value of shipments 2/
		Number	Payroll	Number	Man-hours	Wages		
	Number		1,000 dollars		1,000 hours	1,000 dollars	1,000 dollars	1,000 dollars
1947:								
United States	556	22.4	70.1	18.1	42.5	51.7	337.3	547.7
1 - 4	112	2.6	5.9	2.4	5.6	5.3	26.0	47.6
5 - 9	151	6.8	19.0	5.7	13.4	14.7	78.2	139.7
10 - 19	138	13.5	41.3	11.1	26.5	31.3	171.7	312.3
20 - 49	106	30.3	91.7	25.4	58.3	69.0	418.6	677.6
50 - 99	34	69.5	237.6	58.1	141.9	173.3	1,330.5	1,901.7
100 and over	15	246.7	796.4	182.5	419.5	559.1	3,966.3	6,567.9
1954:								
United States	500	22.9	93.3	17.0	39.1	62.6	254.1	445.0
1 - 4	99	2.8	7.5	2.2	4.9	5.9	24.9	46.8
5 - 9	122	7.4	24.8	5.7	13.4	17.8	54.9	111.1
10 - 19	135	14.2	55.4	10.5	24.7	36.6	143.9	258.3
20 - 49	99	32.5	130.0	25.2	58.4	89.6	386.8	670.6
50 - 99	30	65.8	285.5	49.5	114.8	191.4	795.6	1,334.2
100 and over	15	211.4	929.5	144.1	325.9	598.3	2,421.1	4,202.0

1/ Materials, parts, containers, supplies, fuel, electricity, and cost of contract work.
2/ Including interplant transfers.

Based on 1947 and 1954 Censuses of Manufactures.

Table 16.--Costs per shipment or interplant transfer of products valued at $1,000 and output and costs per production man-hour, by size of rendering establishment, 1947 and 1954

Size of plant, by number of employees	Cost per $1,000 shipment				Output and costs per production man-hour			
	Payroll	Materials 1/	Other costs and profit	Total	Value of output 2/	Cost of materials 1/	Value added 3/	Average hourly wage
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
1947:								
United States	128	616	256	1,000	12.90	7.94	5.03	1.22
1 - 4	125	547	328	1,000	8.49	4.64	3.85	.95
5 - 9	136	560	304	1,000	10.41	5.83	4.58	1.10
10 - 19	132	550	318	1,000	11.80	6.48	5.24	1.18
20 - 49	135	618	247	1,000	11.62	7.18	4.37	1.18
50 - 99	125	700	175	1,000	13.41	9.38	3.86	1.22
100 and over	121	604	275	1,000	15.66	9.45	6.69	1.33
1954:								
United States	210	571	219	1,000	11.37	6.49	4.88	1.60
1 - 4	160	532	308	1,000	9.54	5.08	4.47	1.20
5 - 9	223	494	283	1,000	8.31	4.10	4.20	1.33
10 - 19	214	557	229	1,000	10.47	5.83	4.64	1.48
20 - 49	194	577	229	1,000	11.49	6.62	4.86	1.54
50 - 99	214	596	190	1,000	11.62	6.92	4.69	1.67
100 and over	221	576	203	1,000	12.89	7.43	5.46	1.84

1/ Materials, parts, containers, supplies, fuel, electricity, and cost of contract work.
2/ The value of shipments and interplant transfers used to estimate output per production man-hour.
3/ Difference between value of output and cost of materials.

Based on the 1947 and 1954 Censuses of Manufactures.

Table 17.--Selected statistics for rendering establishments classified according to total number of employees in manufacturing industries in the county, 1947 and 1954

Number of manufacturing employees per county	Establishments	Average per plant						
		All employees		Production employees			Cost of materials 1/	Value of shipments 2/
		Number	Payroll	Number	Man-hours	Wages		
	Number		1,000 dollars		1,000 hours	1,000 dollars	1,000 dollars	1,000 dollars
1947:								
United States..	556	22.4	70.1	18.1	42.5	51.7	337.3	547.7
1-500	84	8.7	24.1	6.9	17.3	17.8	64.0	141.5
501-1,000	71	11.6	33.3	9.7	23.4	24.4	116.8	205.3
1,001-5,000	69	10.5	30.4	9.2	20.9	25.7	95.5	185.2
5,001-10,000	60	10.6	29.2	9.2	20.0	23.6	127.1	225.9
10,001-25,000	71	19.0	57.1	15.8	40.1	42.6	219.6	384.6
25,001-50,000	62	19.0	89.5	16.2	39.6	45.7	292.6	439.3
50,001-100,000 ...	44	28.8	93.2	24.5	55.6	72.0	496.1	752.0
100,001-250,000 ..	57	39.3	128.3	31.7	72.3	92.6	763.2	1,141.0
250,001 and over..	38	92.6	308.2	68.2	157.1	210.4	1,593.7	2,606.9
1954:								
United States..	500	22.9	93.3	17.0	39.1	62.6	254.1	445.0
1-500	71	10.5	33.2	7.7	18.6	23.8	51.7	127.0
501-1,000	70	12.0	42.6	9.6	24.0	31.7	87.7	180.6
1,001-5,000	64	15.0	58.7	12.0	29.4	42.0	111.1	231.2
5,001-10,000	47	14.1	51.4	10.5	24.6	33.4	129.0	248.1
10,001-25,000	60	21.5	79.8	17.3	41.3	58.1	198.4	358.0
25,001-50,000	53	17.7	61.4	12.3	28.8	41.2	204.0	349.2
50,001-100,000 ...	43	28.9	118.6	21.6	46.2	83.4	380.1	600.8
100,001-250,000 ..	53	37.3	159.9	25.4	55.8	101.0	454.3	735.2
250,001 and over..	39	72.2	346.2	51.9	117.2	218.3	1,050.0	1,784.7

1/ Materials, parts, containers, supplies, fuel, electricity, and cost of contract work.
2/ Including interplant transfers.

Based on 1947 and 1954 Censuses of Manufactures.

Table 18.--Costs per shipment or interplant transfer of products valued at $1,000 and output and costs per production man-hour, for rendering establishments classified according to total number of employees in manufacturing industries in the county, 1947 and 1954

Number of manufacturing employees per county	Cost per $1,000 shipment				Output and costs per production man-hour				Average production man-hours per week 4/
	Payroll	Materials 1/	Other costs and profit	Total	Value of output 2/	Cost of material 1/	Value added 3/	Average hourly wage	
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars	Hours
1947:									
United States	128	616	256	1,000	12.90	7.94	5.03	1.22	45.1
1-500	170	452	378	1,000	8.17	3.69	4.48	1.03	48.5
501-1,000	162	569	269	1,000	8.77	4.99	3.62	1.04	46.3
1,001-5,000	164	516	320	1,000	8.84	4.55	4.29	1.22	43.8
5,001-10,000	129	563	308	1,000	11.26	6.33	4.93	1.18	41.8
10,001-25,000	148	571	281	1,000	9.59	5.48	3.94	1.06	48.7
25,001-50,000	204	666	130	1,000	11.09	7.39	3.76	1.15	46.9
50,001-100,000	124	660	216	1,000	13.53	8.92	4.58	1.29	43.6
100,001-250,000	112	669	219	1,000	15.78	10.56	5.14	1.28	43.9
250,001 and over	118	611	271	1,000	16.59	10.14	6.92	1.34	44.3
1954:									
United States	210	571	219	1,000	11.37	6.49	4.88	1.60	44.4
1-500	261	407	332	1,000	6.82	2.77	4.05	1.28	46.5
501-1,000	238	486	276	1,000	7.52	3.65	3.87	1.32	47.9
1,001-5,000	254	480	266	1,000	7.86	3.78	4.08	1.43	46.9
5,001-10,000	207	520	273	1,000	10.09	5.25	4.84	1.36	44.9
10,001-25,000	223	554	223	1,000	8.66	4.82	3.84	1.41	45.9
25,001-50,000	176	584	240	1,000	12.11	7.07	5.04	1.43	44.9
50,001-100,000	197	633	170	1,000	13.00	8.22	4.78	1.80	41.1
100,001-250,000	217	618	165	1,000	13.17	8.14	5.03	1.81	42.2
250,001 and over	194	588	218	1,000	15.23	8.96	6.27	1.86	43.4

1/ Materials, parts, containers, supplies, fuel, electricity, and the cost of contract work.
2/ The value of shipments and interplant transfers used to estimate output per production man-hour.
3/ Difference between value of output and cost of materials.
4/ Based on 52 weeks per year.
Based on the 1947 and 1954 Censuses of Manufactures.

Table 19.--Selected statistics for rendering establishments, classified by primary product specialization, 1947 and 1954

Percentage product specialization	Establishments	Average per plant						
		All employees		Production employees			Cost of materials 1/	Value of shipments 2/
		Number	Payroll	Number	Man-hours	Wages		
	Number		1,000 dollars		1,000 hours	1,000 dollars	1,000 dollars	1,000 dollars
1947:								
United States	556	22.4	70.1	18.1	42.5	51.7	337.3	547.7
Tallow and grease:								
90-100	58	15.9	47.0	13.6	31.0	36.4	127.8	208.2
75-89	133	26.1	86.3	21.8	50.5	65.0	481.4	737.1
50-74	215	25.6	80.9	19.5	47.3	57.2	56.9	625.2
Total	406	24.4	77.8	19.4	46.0	56.7	365.0	602.3
Feed and fertilizer materials:								
90-100	23	13.4	38.2	11.5	24.4	29.3	332.3	537.0
75-89	10	19.5	56.6	16.0	36.2	39.1	304.0	441.3
50-74	23	19.4	68.3	17.2	42.3	56.7	389.2	502.0
Total	56	17.0	53.8	14.7	33.8	42.3	350.6	505.5
Less than 50 percent 3/	94	17.4	46.5	14.5	32.1	35.3	209.7	337.1
1954:								
United States	500	22.9	93.3	17.0	39.1	62.6	254.1	445.0
Tallow and grease:								
90-100	25	9.0	31.8	7.0	15.0	21.9	133.0	182.2
75-89	24	25.0	119.5	19.6	19.6	43.6	325.2	545.0
50-74	120	36.6	159.5	27.3	60.3	107.4	397.9	717.9
Total	169	30.9	134.9	23.2	51.2	91.1	348.4	614.1
Feed and fertilizer materials:								
90-100	32	18.6	68.5	14.6	33.4	48.2	357.6	495.7
75-89	15	17.1	69.0	13.5	36.4	40.2	202.8	340.0
50-74	116	20.1	73.2	14.4	34.8	49.1	215.1	364.5
Total	163	19.5	71.9	14.4	34.7	48.1	241.9	388.0
Less than 50 percent 3/	168	18.1	71.6	13.1	59.2	47.7	170.2	328.3

1/ Materials, parts, containers, supplies, fuel, electricity, and cost of contract work. 2/ Including interplant transfers. 3/ Rendering plants with neither of the two groups of primary products equal to 50 percent of the total value of shipments.

Based on the 1947 and 1954 Censuses of Manufactures.

Table 20.--Value and percentage of shipments including interplant transfers of inedible tallow and grease and feed and fertilizer materials, by industry, region and State, 1947 and 1954

Region and State	Tallow and grease			Feed and fertilizer materials		
	Total value	Renderers	Meat packers and other	Total value	Renderers	Meat packers and other
	1,000 dollars	Percent	Percent	1,000 dollars	Percent	Percent
1947:						
United States	353,106	53.4	46.6	166,213	46.9	53.1
New England and Middle Atlantic	96,201	76.8	23.2	32,587	69.2	30.8
New York	34,702	77.6	22.4	11,266	78.8	21.2
New Jersey	13,990	84.2	15.8	5,906	48.8	51.2
Other	47,509	74.0	26.0	15,415	70.0	30.0
East and West North Central	181,772	40.7	59.3	93,140	41.7	58.3
Ohio	24,496	74.3	25.7	12,297	74.4	25.6
Illinois	44,823	43.1	56.9	26,773	54.0	46.0
Minnesota	18,353	19.3	80.7	7,860	19.6	80.4
Iowa	22,759	23.5	76.5	13,201	20.8	79.2
Kansas	13,511	26.3	73.7	6,767	19.9	80.1
Other	57,830	41.5	58.5	26,242	36.6	63.4
South Atlantic	1/	1/	1/	8,073	35.4	64.6
Florida	1/	1/	1/	744	46.6	53.4
Other	1/	1/	1/	7,329	34.2	65.8
East South Central	1/	1/	1/	2,523	20.4	79.6
West South Central	13,498	34.5	65.5	10,789	43.0	57.0
Mountain	8,586	50.2	49.8	4,773	53.1	46.9
Pacific	34,469	63.3	36.7	14,328	42.4	57.6
California	28,428	65.0	35.0	11,070	45.5	54.5
Other	6,041	55.4	44.6	3,258	31.9	68.1
1954:						
United States	182,570	55.2	44.8	169,673	53.5	46.5
New England and Middle Atlantic	47,913	82.1	17.9	1/	1/	1/
New York	18,343	82.1	17.9	9,245	88.0	12.0
New Jersey	7,961	75.8	24.2	3,766	74.5	25.5
Other	21,609	84.4	15.6	1/	1/	1/
East and West North Central	85,466	36.2	63.8	89,292	44.4	55.6
Ohio	13,025	45.7	54.3	12,592	64.3	35.7
Illinois	18,208	38.3	61.7	20,601	48.4	51.6
Minnesota	7,251	19.4	80.6	8,837	20.2	79.8
Iowa	11,623	19.5	80.5	13,525	37.2	62.8
Kansas	4,651	20.8	79.2	4,653	22.3	77.7
Other	30,708	43.6	56.4	29,084	47.2	52.8
South Atlantic	10,335	71.7	28.3	13,043	65.3	34.7
Florida	1,676	87.4	12.6	1,099	79.3	20.7
Other	8,659	68.6	31.4	11,944	64.0	36.0
East South Central	3,290	19.5	80.5	5,061	44.5	55.5
West South Central	7,452	53.9	46.1	12,055	41.4	58.6
Mountain	5,004	41.3	58.7	1/	1/	1/
Pacific	23,109	70.9	29.1	17,493	59.2	40.8
California	19,337	75.3	24.7	13,741	65.6	34.4
Other	3,772	48.4	51.6	3,752	35.6	64.4

1/ Not reported to avoid disclosure of the operations of an individual company.

Based on 1947 and 1954 Censuses of Manufactures.

Table 21.--Quantity and average value per ton of shipments and interplant transfers of feed and fertilizer materials by kind and use, region and State, 1954 1/

Region and State	Quantity and value by kind of feed and fertilizer material						Quantity and value by use of feed and fertilizer material			
	Meat scraps		Tankage, wet		Tankage, dry		Feed		Fertilizer	
	Quantity	Value per ton	Quantity	Value per ton	Quantity	Value per ton	Quantity	Value per ton	Quantity	Value per ton
	1,000 tons	Dollars	1,000 tons	Dollars	1,000 tons	Dollars	1,000 tons	Dollars	1,000 tons	Dollars
United States	1,010.3	92	415.0	45	315.9	90	1,389.8	92	169.6	79
New England	50.8	89	2/	2/	2/	2/	63.4	86	2/	2/
Middle Atlantic	146.5	87	18.2	75	62.1	88	180.5	89	56.0	72
New York	80.8	89	2/	2/	2/	2/	74.2	92	32.6	65
New Jersey	13.7	76	2/	2/	2/	2/	31.0	88	8.3	94
Pennsylvania	52.1	88	13.7	70	27.2	87	75.3	87	15.2	74
East North Central	298.6	92	98.2	49	110.0	86	455.4	90	26.5	75
Ohio	86.4	95	16.2	36	20.1	80	115.6	94	6.9	79
Indiana	28.3	69	29.8	33	12.1	76	40.1	72	1.7	77
Illinois	94.5	97	43.4	51	45.5	95	179.3	92	13.5	77
Michigan	32.9	88	2/	2/	2/	2/	49.0	86	2/	2/
Wisconsin	56.6	94	2/	2/	2/	2/	71.4	92	2/	2/
West North Central	135.7	93	98.5	65	81.1	102	302.6	96	15.4	77
Minnesota	35.9	97	20.4	83	27.7	101	64.4	101	2/	2/
Iowa	58.9	92	2/	2/	2/	2/	105.2	97	2/	2/
Missouri	17.8	88	17.0	61	2.5	96	25.6	85	2.3	70
Nebraska	37.3	88	2/	2/	2/	2/	52.7	91	2/	2/
Kansas	37.0	94	2/	2/	2/	2/	42.8	95	2/	2/
Other	8.8	107	2/	2/	2/	2/	11.9	96	2/	2/
South Atlantic	73.2	86	121.2	25	18.0	86	89.6	86	15.9	85
Virginia	14.9	89	2/	2/	2/	2/	14.9	89	1.9	101
Florida	2/	2/	2/	2/	2/	2/	12.3	77	---	---
Other	2/	2/	2/	2/	2/	2/	62.4	88	14.0	83
East South Central	19.8	93	21.5	36	7.1	70	34.7	92	1.1	86
West South Central	70.8	92	26.2	35	12.5	73	97.3	90	2/	2/
Texas	51.1	89	9.6	55	7.8	72	70.2	87	2/	2/
Other	19.7	103	16.6	23	4.7	75	27.1	98	2/	2/
Mountain	39.9	88	2/	2/	2/	2/	46.1	89	2.4	95
Pacific	115.1	100	21.2	42	11.1	84	120.2	100	36.4	89
California	94.8	103	16.9	46	10.3	84	92.2	100	29.0	93
Other	20.3	90	4.3	26	.8	90	28.0	99	7.4	74

1/ Includes shipments and interplant transfers of the rendering, meatpacking, and other industries.
2/ Not shown to avoid disclosure of the operations of individual companies.
Based on 1954 Census of Manufactures.

Table 22.--Live weight of commercial slaughter, production of inedible animal fats, and production of fats as a percentage of live weight, 1935-57

Year	Live weight cattle, calves, sheep, lambs, and hogs	Tallow and grease	
		Production	Percentage live weight
	Million pounds	Million pounds	Percent
1935	23,043	740	3.2
1936	25,990	902	3.5
1937	25,232	845	3.4
1938	26,539	956	3.6
1939	28,223	1,292	4.6
1940	30,858	1,315	4.3
1941	32,037	1,505	4.7
1942	36,205	1,660	4.6
1943	40,181	1,608	4.0
1944	41,391	1,858	4.5
1945	37,959	1,666	4.4
1946	36,923	1,594	4.3
1947	38,978	1,904	4.9
1948	35,464	1,887	5.3
1949	36,153	1,861	5.1
1950	37,056	1,910	5.2
1951	36,276	1,922	5.3
1952	38,822	2,061	5.3
1953	42,021	2,289	5.4
1954	43,037	2,311	5.4
1955	46,049	2,507	5.4
1956	48,229	2,730	5.7
1957	46,056	2,655	5.8

Tallow and Grease Production, Facts for Industry, Fats and Oils, U. S. Bureau of the Census. Other data from U. S. Department of Agriculture, Agricultural Marketing Service, Crop Reporting Board.

Table 23.--Supply, disposition, and utilization of inedible tallow and greases, 1930-58 1/

Year	Supply				Disposition		Utilization in nonfood products					
	Apparent production 2/	Imports	Stocks, Jan. 1	Total	Exports and shipments	Domestic disappearance	Soap	Foots and loss	Feed	Fat splitting	Other	Total 3/
	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.	Mil. lb.
1930	867	1	162	1,030	73	741	687	---	---	54		741
1931	884	2	215	1,101	79	773	653	---	---	119		773
1932	844	1	249	1,094	58	786	693	---	---	93		786
1933	926	1	250	1,177	66	767	634	1	---	132		767
1934	1,025	32	343	1,401	52	952	806	1	---	145		952
1935	703	4/190	397	1,290	20	914	761	1	---	152		914
1936	825	4/ 60	356	1,242	17	923	759	1	---	163		923
1937	855	4	302	1,161	6	886	708	1	---	177		886
1938	929	1	269	1,199	4	942	799	1	---	142		942
1939	1,127	2	253	1,382	6	1,079	906	1	---	172		1,079
1940	1,375	1	296	1,673	8	1,234	1,043	1	---	189		1,234
1941	1,551	30	431	2,012	7	1,649	1,368	3	---	279		1,649
1942	1,742	64	355	2,161	6	1,854	1,528	0	---	326		1,854
1943	1,649	33	301	1,983	3	1,759	1,360	0	---	200	199	1,759
1944	1,943	56	220	2,219	27	1,923	1,530	0	---	215	178	1,923
1945	1,751	32	270	2,052	13	1,839	1,364	0	---	277	198	1,839
1946	1,658	3	201	1,862	13	1,677	1,210	0	---	297	170	1,677
1947	2,023	1	173	2,197	69	1,882	1,526	0	---	193	163	1,882
1948	1,940	1	246	2,187	88	1,782	1,451	0	---	185	145	1,782
1949	2,132	2	317	2,451	433	1,666	1,346	3	---	166	151	1,666
1950	2,272	2	352	2,626	536	1,807	1,363	0	---	229	215	1,807
1951	2,256	3	283	2,542	537	1,660	1,195	0	---	243	222	1,660
1952	2,318	1	345	2,664	748	1,541	1,084	1	---	186	270	1,541
1953	2,690	1	375	3,065	1,197	1,568	1,026	1	---	252	290	1,568
1954	2,679	4	300	2,983	1,162	1,559	907	9	111	242	291	1,559
1955	2,965	3	262	3,231	1,296	1,635	864	16	181	278	295	1,635
1956	3,232	1	299	3,533	1,493	1,686	813	16	296	286	276	1,686
1957	3,080	3	353	3,436	1,381	1,777	789	12	387	284	305	1,777
1958 5/	2,739	6/	278	3,017	1,115	1,616	727	9	353	256	271	1,616

1/ Totals computed from unrounded data.
2/ Apparent production computed from factory consumption, net foreign trade, and change in stocks. Reported factory production excludes that from small rendering plants.
3/ Includes small amounts used in drying-oil products in some years.
4/ Reported imports minus estimated imports of edible tallow.
5/ Preliminary.
6/ Less than 500,000 pounds.

Fats and Oils Situation, FOS-189, March 1958, Agricultural Marketing Service, U. S. Department of Agriculture.

* U.S. GOVERNMENT PRINTING OFFICE . 1959 O—511291